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THE VETERINARY PROFESSION IN CANADA

THE LIVE STOCK interests of Canada have always constituted one of its greatest assets, and the veterinary profession has for many years rendered excellent service in protecting these interests. The profession has, however, only of recent years years obtained general recognition from our legislative bodies. It is possible that the freedom of this country from epizootics of the more serious diseases has been largely responsible for the delay which has occurred in this connection.

It is a matter of history that it required almost the complete destruction of the herds of cattle, sheep and swine in the countries of Europe and Asia in the sixteenth, seventeenth and eighteenth centuries to convince the authorities in these countries that the properly trained veterinarian was essential to the well-being of the live stock interests, and that as a protective measure for their future, immediate action had to be taken to establish and support veterinary schools.

The Manitoba Legislature was the first authoritative body in Canada to appreciate the importance of regulating veterinary practice. This body placed an act on the statutes in 1890, which requires all practitioners to register with the Veterinary Association of that province. This association is an incorporate body, with an official registrar, who examines the credentials of

the applicants and registers those who possess diplomas from recognized veterinary colleges, after passing an examination held by an examining board.

Many members of the profession in the Province of Manitoba were held in high esteem by the general public, and had been honored in many ways by the residents of the communities in which they resided and practiced long before the passing of this act. Some of these members had seats in the Legislature and, being men of outstanding ability and strong character, were able to impress upon the authorities the importance and necessity of regulating the practice of veterinary medicine.

No further legislation of this kind was enacted for sixteen years, the authorities in the other eight provinces of the Dominion being content to permit anyone to practice within their respective boundaries, whether qualified or not.

There were many veterinary associations throughout the country, but it was difficult to obtain united and concerted action on the part of the profession. Efforts were, however, made by outstanding individuals to convince the authorities of the necessity of taking suitable measures to protect the live stock interests. In 1906 the Alberta Legislature passed an act drafted on similar lines to the Manitoba Act, and a year later the Province of British Columbia followed their example. Saskatchewan and Quebec took similar action in 1909, followed by Nova Scotia in 1913. Prince Edward Island passed suitable legislation in 1920, and the old Province of Ontario hesitated to do so until the end of that year. New Brunswick is now the only province in Canada not having legislation regulating veterinary practice. An attempt was made to induce the authorities of that province to take suitable action but without success. There are, however, very few opportunities for veterinary practice in New Brunswick and there are, therefore, only a very limited number of practitioners within its boundaries.

It is very gratifying to the profession that it has, even at this late date, been so generally recognized. The great changes which have taken place in recent years in the field of study in veterinary science, which now aims more than ever at the control of animal diseases and their prevention, places the profession in a much more exalted position. The modern stockman is now highly trained in animal husbandry and other matters relating to agriculture, and the veterinarian finds that it is getting more

difficult for him to command the respect and confidence of his clients, who demand better and more efficient service. The veterinarian must now be in a position to discuss intelligently with the stockmen all matters pertaining to stock raising. It is of the utmost importance that veterinary science should be well supported by the public generally, and members of the profession should give each other mutual support on the general principles that affect the profession as a whole. They must value their calling by the use they can be to the country, but they must also do their part to convince public bodies of the value of their services. The demands of the world-war have led to international consideration of the best methods of conservation, and it is important that every veterinarian should assist in minimizing the large wastage from preventable disease. Our existence as a profession depends upon the maintenance of a high standard of practical scientific attainment. The attitude of the American Veterinary Medical Association, with regard to raising the standard for veterinary education is, in view of these facts, generally appreciated.

The Honorable Minister of Agriculture for Canada, a few years ago, realized the necessity of encouraging unity of thought and action in the profession, and with this object in view called a conference in Ottawa with the intention of forming a veterinary advisory board. Representatives of the veterinary associations in each province attended this conference and matters of importance to the profession were thoroughly discussed. While a permanent advisory board has not so far been appointed, the profession is of the opinion that such action should be taken, as conferences by such a board would be of great value.

As a further means of providing a Canadian medium for the interchange of opinions and the dissemination of information to the profession the first Canadian veterinary journal, the *Canadian Veterinary Record*, was published as a bi-annual magazine last year by a few enterprising veterinarians, who realized the necessity of such a medium. It is receiving general support, and is now being published quarterly. This magazine is already advocating, through its pages, a Canadian National Veterinary Association, as well as Dominion registration for veterinarians. The enactment of suitable legislation by the federal authorities is suggested with a view to enabling veterinary practitioners to obtain such registration as would entitle them to

practice in any of the provinces on payment of the required fees to the veterinary association of the particular province in which they desire to locate.

It further advocates that provision be made for the creation of a Veterinary Council or Board for the Dominion, to promote and bring into effect the establishment of a uniform standard of qualification for veterinary practice, this qualification to consist of a diploma or degree in veterinary science from an accredited college or university having a curriculum extending over a period of four academic years.

These suggestions denote progress in the right direction, and should be favorably received by the profession. The time was never more opportune for advanced measures. The live stock breeders are watching the profession with a critical eye. They realize more acutely than in the past the necessity of maintaining the health of all domestic animals and are demanding a higher standard of proficiency and professional service.

A member of the profession occupies for the first time in the history of this country the important position of Federal Minister of Agriculture.

The country is better prepared to teach those who desire to enter the profession. It has two accredited veterinary colleges, which require a much higher standard of qualification for entrance than in the past. These colleges are equipped with adequate facilities to suitably train their students, so that they can successfully cope with the present needs of the live stock industry.

Our past experience has shown the vital necessity of unity in action. The achievements of the Veterinary Medical Association are excellent examples of such a policy. It is, therefore, the duty of every veterinarian in Canada to take a keen interest in our profession as a whole, and to support in a practical manner any measures which may be advanced to improve the status of the profession with a view to rendering more efficient service to the live stock industry. G. H.

BRITISH POLICY REGARDING FOOT-AND-MOUTH DISEASE

THE METHOD followed by the British veterinary authorities in combating foot-and-mouth disease is similar to that successfully used in the United States—namely, quarantine, slaugh-

ter with compensation, and disinfection. In answer to criticism of this policy the British Ministry of Agriculture and Fisheries has issued a statement in justification of its course. The cost of this method is placed at only $60,000 for one year, for the protection of a live-stock industry valued at more than a billion and a half dollars. By way of contrast it is shown that Spain's policy of isolation and attempted cure cost well over $25,000,000 in 1919, while in 1919-20 the disease cost the Netherlands a like sum for a policy forced on that country by her geographical position. The willingness of the United States to expend $5,000,000 for eradication by slaughter in 1914 is cited with approval.

"It will be seen by those who will examine the facts carefully," says the British official statement, "that our present policy is the cheapest and most effective that could be devised, and it is necessary to add that while it remains our policy—and there is no suggestion from any responsible quarter that it should be reversed—it is illegal for the owner of any affected animal to attempt a cure." To attempt a policy of isolation and cure, continues the statement, "could only mean that foot-and-mouth disease would become sooner or later endemic in these Islands. Consequently the whole valuable export trade in the finest pedigree stock in the world would be destroyed; our meat supply and our milk supply would be endangered and the present free intercourse of farmers with their markets would become a thing of the past."

ACCREDITED VETERINARIANS FOR ACCREDITED HERD WORK

Already a few accredited herds have been turned back to the practicing veterinarians who have been accredited to conduct tuberculin testing of accredited herds in accordance with the uniform methods and rules. The rules adopted by the United States Livestock Sanitary Association, December 3, 1919, and amended December 6, 1920, provide as follows:

(a) When a herd has been officially accredited by the United States Department of Agriculture and State, it shall be, when ordered by the Livestock Sanitary Officials of the State, tuberculin tested annually by any veterinarian whose name is upon the accredited list of veterinarians approved by the United States Bureau of Animal Industry, provided that, before any veterinar-

ian other than one who devotes his entire time to the work of any State or the Bureau of Animal Industry can be approved for accredited herd work, he shall have passed an examination conducted by the proper livestock sanitary officials of the State in which he resides and the Bureau of Animal Industry. He then shall be eligible to conduct annual tuberculin tests upon herds which have been officially accredited upon dates approved by the proper State livestock sanitary, official and the inspector in charge of the Bureau of Animal Industry in the State wherein the herd is located.

(b) No herd test can be made by such an approved veterinarian unless he has instructions in writing from the State officials to that effect. The date of the annual tests for each herd shall be recorded in the State office, and also in the office of the inspector in charge. On any annual test the State and the Bureau reserve the right to have a regularly employed official present on the farm to supervise the testing done by the approved veterinarian.

(c) The approved veterinarian shall conduct each test strictly in accordance with instructions issued by the Bureau of Animal Industry to employes engaged in cooperative tuberculosis eradication work. At the conclusion of each test the approved veterinarian shall submit to the State veterinarian and the inspector in charge of the Bureau of Animal Industry a copy of the record of the test.

(d) Any animal of a herd under supervision which may react in any herd tuberculin tested by an approved veterinarian shall be marked for the purpose of indentification in accordance with the regulations of the State in which the animal is located.

(e) Tuberculin tests applied by veterinarians other than those regularly employed by the State and the Bureau of Animal Industry shall be paid for by the owner of the herd.

Examinations of veterinarians have been held in five States, and the number accepted for accredited herd work appears opposite the names of these States as follows:

Minnesota, 152; Virginia, 39; Alabama, 29; North Carolina, 16, and Pennsylvania, 183.

Arrangements are now being made to hold examinations in 17 or more other States June 25, 1921. These examinations will be held at one or more points in each State where State or Bureau offices are maintained. Every effort is made to fix the dates and places for holding the examinations so as to cause the least inconvenience to the greatest number of veterinarians who are desirous of qualifying for the accredited herd testing. In those States in which examinations have been held most of the

leading practitioners have availed themselves of the opportunity of qualifying for this work.

There is a distinction between veterinarians who are approved to tuberculin test cattle for interstate shipment, under Regulation 7, B. A. I Order 263, and those who are accredited to conduct accredited herd tests, as is indicated by the following definitions:

1. An "approved" practicing veterinarian is one who has been authorized by the proper State official and the Bureau so that he may apply the tuberculin test to cattle intended for interstate shipment. Said "approved" veterinarian is allowed to tuberculin test cattle that are to be added to accredited herds, or herds in the process of accreditation, but is not permitted to tuberculin test accredited herds of cattle.
2. An "accredited" practicing veterinarian is one who has successfully passed an examination of the State and the Bureau in order that he may tuberculin test accredited herds of cattle under the provisions of Section 6 of the Uniform Methods and Rules govering accredited herd work which were approved by the Bureau December 6, 1920.
3. All "accredited" veterinarians will also have to be "approved" veterinarians, but if an "approved" veterinarian fails to pass the examination for accredited herd work, he may continue to tuberculin test additions to accredited herds unless he is disapproved for that work by the State and Bureau officials in charge in the State where he is located.

Under the above paragraph 1 there have been approved for interstate testing 7,098 veterinarians.

With the development of accredited herd work in the various States there shall be no reason why the work may not be properly handled by the large corps of veterinarians who will be accredited to do that class of work. Obviously accredited herds must be officially recognized and official supervision must be maintained over the testing of those herds. No State or National Government would affix its mark of approval upon the testing of herds without having knowledge of the manner in which the work was conducted. Of necessity the methods of testing must be uniformly conducted by the veterinarians; otherwise the livestock owners, whose cooperation is essential for the success of the campaign, would have reason for doubting the accuracy of the work. This does not mean domination but cooperation and coordination. To a very large degree the success of the project depends upon the efficiency and integrity of those

conducting the test. Therefore it behooves every person interested in the campaign to labor diligently to fulfill his obligations and responsibilities.

The veterinary profession is confronted with the great responsibility of maintaining a high health standard for the ten billion dollar livestock industry of the United States. This responsibility must be assumed by the private as well as the official veterinarians representing cities, counties, States and the Federal Government. These forces must of necessity so align themselves and coordinate their endeavors that the industry shall be best served.

The official organizations created by Congress and the respective legislatures must render at stated periods reports of the progress of their work, and perforce their records must be based upon facts known to them which can be acquired in but one way, viz., by close contact and supervision. J. A. K.

CALMETTE'S TUBERCULOSIS EXPERIMENTS

In September, 1920, Dr. A. Calmette, together with C. Guerin, both of the Pasteur Institute of Paris, published an article relating to experimental studies on the vaccination of cattle against tuberculosis. This article was quite fully abstracted on page 599 of the February, 1921, JOURNAL. In a recent letter Dr. Calmette states that the newspapers unfortunately have somewhat perverted the sense of his article and then explains as follows:

"I am carrying out these experiments, which are giving excellent results. However, there is no question in any way of transferring them at the present time into actual practice. They must be continued for a long time, and I intend to extend them to anthropoid apes in a laboratory that we hope to install in French Guinea as soon as we can find the indispensable resources."

If Calmette and Guerin were men of less consequence in the field of medical research, their claims that they have found a method to attenuate bovine tubercle bacilli and that such attenuated bacilli may be used as a vaccine, would not impress the scientific world as being very important. Naturally the discovery of a safe and effcient vaccine against bovine tuberculosis would be a great achievement of enormous economic value, and

it is to be hoped that the conclusions of these scientists will stand the test of time and further investigations.

However, we should not lose sight of the fact that the conclusion on tuberculosis immunization was based on the results obtained from only 10 calves. Four of these were used as controls, that is, they were exposed to badly diseased cattle without receiving any protective vaccination. One of these or 25 per cent failed to show any lesions of tuberculosis on postmortem, even though it had not been protected by vaccination. Of the three once vaccinated calves, two were found diseased on postmortem and one healthy or a failure to protect in 66 per cent of the calves. The calf that was twice vaccinated and the remaining two calves that were thrice vaccinated all remained healthy, indicating an efficiency of 100 per cent, although they were exposed to the same infection as the controls. As Calmette admits it is highly desirable that these experiments should continue longer on a sufficiently large scale to justify a general conclusion, but thus far this opportunity has not presented itself.

A NEW VETERINARY COLLEGE FOR SOUTH AFRICA

We learn from the *Rand Daily Mail*, dated 18th September, 1920, South Africa, that Sir Arnold Theiler sailed for Europe on the 19th, and will be absent from the colony for ten months, during which time he will visit the important centers of research in the British Isles, the Continent and America. He considers this an ideal method of keeping abreast of the advance in research, and insists that the members of his staff take similar trips. Sir Arnold is head of the Research Institution at Onderstepoort, where he has done much research work for Veterinary Science, regarding the problems of the livestock industry of South Africa.

Plans are being made for the building of a Veterinary College at Onderstepoort, to cost approximately $800,000, and will, when completed, afford accommodation for fifty students. It is quite likely that on his return Sir Arnold will have with him a few experts to increase the staff at Onderstepoort, which would otherwise be too small to cope with the extended duties caused by the establishment of the Veterinary College. The course will extend over a period of five years, the last two years being completed in the field.—(From *The Canadian Veterinary Record*, March, 1921.)

THE INTERNATIONAL EXCHANGE OF LIVESTOCK[1]

By G. F. FINLAY

Walter and Eliza Hall Veterinary Research Fellow, Sydney University, Australia

ALL MATTERS pertaining to the purebred livestock industry and to the improvement of the ordinary flocks and herds are of special interest to the veterinarian, for the prosperity of the veterinary profession is directly dependent upon the value of the livestock of the country. Questions relating to importations and exportations of purebred stock are of vital importance to breed associations, and as the veterinary authorities have much to do in regulating this trade, it is very necessary that we interest ourselves in the matter and adopt a sympathetic attitude toward the purebred stock owner, for he is the man chiefly responsible for the improvement in our ordinary livestock.

THE EXPORT TRADE OF GREAT BRITAIN

The breeders of Great Britain have up to the present time held a preeminent position as improvers and distributors of purebred stock. During the last 25 years the average value of the livestock exported from Britain has been over $5,000,000 per annum. This sum distributed among comparatively few breeders has enabled them to build up studs of unrivaled merit and to supply the home demand for high-class breeding stock. Were it not for the export demand, the ordinary stock of Britain would not be of such excellence as it is today.

After making due allowance for a great falling off during the war, statistics show that there has been a marked decrease in the export of cattle, sheep and swine during the past 25 years. That horses did not show this falling off, but rather up to 1914 showed an annual increase in numbers exported, can be attributed to the military preparations of various countries. The Thoroughbred has a world-wide reputation as a cavalry horse, while the draft breeds are also popular. The importance of this trade to the breeders of Great Britain can be estimated when it is realized that the average yearly number of animals exported for a period of 25 years ending in 1918 was 36,284 horses, 3,631 cattle, 6,306 sheep, 473 pigs. The future of the

[1] Presented at the Fifty-seventh Annual Meeting of the American Veterinary Medical Association, Columbus, Ohio, August, 1920.

horse trade will be greatly influenced by the result of the League of Nations' attempt to control military preparations.

It is the export of cattle and sheep that has been of most importance to America. The beef breeds of Britain, especially the Shorthorn, Hereford and Aberdeen Angus, have no rivals. The two former breeds are the most popular for grading up in all the great meat-producing countries of the world. All the popular mutton breeds of sheep are similarly of British origin. The influence of British hogs, however, has been less remarkable, for America, the greatest hog-producing country of the world, has built up its three principal breeds, the Duroc-Jersey, the Poland-China and the Chester White, from foundation stock drawn from many different countries.

The continuous export of breeding stock of the best quality, however, to other great livestock countries has resulted in the building up of herds and flocks of purebred stock in those countries, which are almost as good and in some cases quite as good as the parent stock. The natural result is the falling off to a considerable extent in Britain's export trade in cattle, sheep and swine.

Great Britain's contribution to the dairy industry is greater than the relative number of the different breeds in the United States of America would indicate. The Ayrshire is much more popular in Australia and New Zealand than in America, and has made a reputation for herself as being exceptionally hardy and able to adapt herself to different environments. In the two former countries the milking Shorthorn rivals the Jersey in popular favor and has attained a degree of excellence above that in England.

Britain has been frequently described as "the stud farm of the world." This epithet has been well earned in the past, but there is every indication that it will not hold good in the near future. There is no danger that Britain will be supplanted from her preeminent position in the livestock world, but the excellence of the stud stock in the great meat and wool-producing countries makes it less necessary than heretofore to import from that country.

THE CHANNEL ISLANDS

The breeders of this small section of the British Empire have set an example in the science and art of breeding that could

with advantage be followed closely by patrons of other breeds. The Jersey has long been recognized as the aristocrat of the bovine world. It combines those three ideals of the dairy cow—capacity for production, constitution, and beauty of form—to a greater extent than the other breeds. I can not quote statistics as to the export of stock from the Channel Islands, but there continues to be a demand from dairying countries all over the world for both Jerseys and Guernseys. Many breeders consider that the time is not yet in sight when America could safely dispense with infusions of Island blood. This applies to a greater extent to Guernseys than to Jerseys.

THE CONTINENT OF EUROPE

Practically all the great breeds of livestock that originated in Continental Europe have been improved in the younger countries. Thus the Holstein-Friesian in the United States and Canada is superior to that of Holland. In the latter country there is no advanced registry; also it is the custom to slaughter the herd bulls at an early age. These two factors are evidently retarding the development of the breed there.

The Merino sheep originated in Spain and has been improved in France, Germany and the United States, but Australia is the home of the highly improved modern type.

The Percheron horse of America is equally as good as that of France, though that statement would only hold good for purebred animals.

It can therefore be seen that there is no longer any need for the younger countries to import from Continental Europe. Also the prevalence of contagious diseases there makes it undesirable.

THE LIVESTOCK OF AMERICA

It must be conceded that the United States occupies the position next to Great Britain among the great purebred livestock countries. This applies to purebred stock, but probably does not hold good for ordinary range stock. A traveler in this country can not but be struck by the contrast between the range stock of some of the Southwestern States and the herds in the Corn Belt. The high standard of the purebred beef breeds makes it quite unnecessary to make continuous demands on Britain.

The desire to build up an export trade, as evidenced by the

action of the United States Department of Agriculture in sending officials to South America, will establish a healthy rivalry with Great Britain and will be to the interest of the southern republics. The hope of United States breeders of beef cattle is, of course, Brazil, but a prolonged educational policy will be necessary before any great progress in grading up their inferior herds can be made.

It is in the dairying industry, however, that America is attracting world-wide interest. Perhaps in one or two breeds first place must be conceded to the country of origin, but for all-round excellence in purebred stock America takes first place, though I would group Canada with the United States in making that statement. In the past American breeders have imported the best dairying stock to be found in the Channel Islands, Great Britain and Holland, and have not only succeeded in keeping up the standard, but have, in the case of the Holstein-Friesian breed particularly, succeeded in improving on the foundation stock.

The main factor in effecting this improvement has been the advanced registry. This system of registration has been taken up by Australia and New Zealand and in a modified form by Great Britain and the Channel Islands. There is every indication that it is revolutionizing the whole dairying industry. Prior to its advent the standard of perfection was show type, in which beauty of form, dairy type and minor fancy points were the objects in view. Great emphasis has been placed on dairy type, but during the past few years genetecists have been making very thorough biometrical research as to what degree of correlation exists between conformation and milk production, and their results show that there is no justification for placing such emphasis on dairy type as we have been doing in the past. The advanced registry shows up those families which possess the hereditary factors for milk production, but has practically eliminated from popular favor families which, while of good dairy type, yet do not possess the factors for heavy production. After all, that is the main object in view with dairy breeds. In practical effect advanced registry has resulted in a new method of selection; that is, selection on the basis of the genetical constitution of individuals as regards factors for milk production. The system is more successful in the United States

than in other dairying countries owing to the fact that records are available which cover many generations.

America should have an export trade in dairy stock to countries in the southern hemisphere. But the American breeder as yet is not held in the same confidence as the older British breeder, and therefore it is to the interest of the breed associations to take every action to safeguard foreign purchasers of stock. A foreign buyer should as far as is possible be given a guaranty against tuberculosis.

A rather puzzling practice to breeders from other countries is the different ways of quoting fat or butter records. This is evidently done to impress the uninitiated, but actually rather surrounds the records with suspicion. Another thing that possibly reacts disadvantageously to a breed is the doubt one hears frequently expressed as to the genuineness of some of the big prices paid for stock. There may not be ground for such rumors, but they travel even out of this country.

THE ATTITUDE OF BREEDERS

Stock breeders as a class rather fail to appreciate the difficulties facing the veterinary authorities in regulating the international exchange of stock so that serious contagious diseases shall not be introduced. However, it must be admitted that the open door for stock importations as far as is compatible with safety is greatly to the interest of breeders and therefore to the whole livestock industry. In some of the younger livestock countries certain breeds have attained such a standard of excellence that it is no longer desirable to make regular importations from Britain. The breed associations, however, are the best judges of that and can protect their breeders from the competition of an influence of unnecessary stock which carries the magic word "imported," by putting high registration fees on such stock.

EXPERIMENTAL BREEDING

Both North and South America have imported animals for experimental breeding purposes to a considerable extent. The attempts to establish new breeds and in some cases new species by the hybridization of existing species to meet certain climatic conditions have not been very successful. The cross between the zebu and European breeds produces progeny of typical hybrid

vigor, but, according to reports from Brazil, deterioration results in subsequent generations unless they are graded back to the parent races, and even deterioration in the pure zebu stock is reported in that country.

The attempts to establish a breed intermediate between the American bison and our beef breeds of cattle has not been successful up to the present, though reports show that the female hybrids can be graded back to either parent race. I understand the Canadian Government is continuing the experiment.

Similarly the attempts to (1) establish new breeds by crossing the Asiatic yak with the Galloway, as proposed by Canada and Alaska, (2) crossing the Siberian fat-rumped sheep with sheep of British breeds in South Dakota, and (3) crossing the Tunisian sheep with modern breeds in Arizona are all interesting to the genetecist, but our present knowledge of the laws of breeding scarcely lead us to expect the results the experimenters aim for.

THE INTERNATIONAL ASPECT

The world's supply of animal foodstuffs is not increasing as fast as is the human race. At the same time Asiatic races are becoming educated to demand far more meat and milk than they have been accustomed to in the past. As the population of a country increases, stock raising must give way to crop production to a great extent. These factors tend to make animal foodstuffs increase in value. As these are, however, our most important source of protein, it would seem to be to the interest of every nation to do all in its power to make the world's supply of livestock keep up to the world's population.

The greatest possibilities for improvement in existing conditions are in some of the South American republics. In Brazil, for example, there are approximately 30,000,000 cattle, but they are of inferior quality. Reports indicate that zebu blood is very widely disseminated, but is not effecting improvement in the range cattle. The government is alive to the importance of the matter and offers subsidies for imported purebred stock. In the Argentine the livestock, and especially the cattle, are of high standard, for that country has been the most consistent importer of British beef breeds during the last 25 years. Argentina will probably supply most of the purebred stock required by the other South American republics.

South Africa imports considerable numbers of purebred stock annually, including sheep from Australia.

Australia and New Zealand are both noted for the excellence of their livestock. In spite of the great distance of these countries from Great Britain, importations of all classes of purebred livestock have been kept up. America has had a very small part in supplying that demand, but I believe if more were known of American livestock a trade could be established, especially in cattle and swine. Some of your best-bred Herefords and Aberdeen Angus stock would be a decided asset to us, though the Angus has only just recently been taken up.

Your dairy breeds, however, would be of the greatest value. New Zealand in the past has imported a number of high-class Holstein-Friesians from Canada, and these ultimately succeeded in capturing the Australasian records for butter and milk production. These importations have had a remarkable influence on the dairy industry in New Zealand. There is no reason why America could not find a market in Australia for some of her best specimens of each of the dairy breeds and especially the Holstein-Friesian.

No one will dispute the superiority of the swine of the United States and Canada, and it is rather surprising that such excellent breeds as the Duroc-Jersey, the Chester White and the Hampshire have not been taken up by other countries. I believe Australia and New Zealand could very well do with importations from this country, but such a trade could be better organized if your swine breeders could send out some selected stock similar to the trial shipment sent to South America a few months ago.

In exchange, Australia could supply you with Merino sheep. A type has been produced there which has no equal as regards quality of fleece, conformation and hardiness, and many American sheep breeders recognize that it would be to their interest if they could secure these sheep. The type corresponds somewhat to your Delaine B, having a plain body with two or three neck folds. I believe a few shipments of these sheep to this country would have an immense influence in establishing a standard type. The rather diverse types that exist here can not be to the interest of the wool trade. At present there is an American embargo on Australian sheep, due to the existence of pleuropneumonia in cattle in some parts of the country.

New Zealand has been recognized by American sheep breeders as possessing some excellent mutton breeds, and New Zealand Romney Marsh, Lincoln and Corriedale sheep seem to be gaining favor in this country. The New Zealand Romney Marsh is a magnificent large mutton sheep, showing great resistance to foot rot and liver fluke, and is considered superior to its English ancestors. The Corriedale originated in New Zealand some 30 years ago by combining a Merino-Lincoln cross with a small amount of Merino-English Leicester blood. There seems to be a blending inheritance, and they breed fairly true to type. I have seen sale advertisements in the United States of grade Corriedale sheep of half and three-quarters blood, for breeding purposes. That practice is scarcely likely to react in favor of the breed, however.

Although New Zealand sheep are playing an important rôle in this country, I am convinced that Australian Merinos would be of still greater value if only the embargo could be raised. The reciprocal interchange of stock could probably be brought about if there were only a better understanding of actual conditions between the veterinary authorities of the two countries. I can think of no better method of gaining that knowledge than by an international veterinary conference. Australia could be depended upon to give her active support to such a conference.

It would appear that the livestock of most of the important meat and wool producing countries has reached such a standard that it is no longer very necessary to import regular large shipments of purebred stock from Great Britain. But owing to the law of variation in breeding, superior families will continue to be developed in all breeds, and it is to the interest of the livestock industry of all countries that breeders be allowed to import and add such desirable blood when the danger of introducing disease is not too great.

Iowa Homestead in an article urging the State legislature to appropriate money for tuberculosis-eradication work says: "If the State of Iowa would spend from half to three-quarters of a million dollars annually for tuberculosis-eradication work and the Federal Government would continue to help in the clean-up, as it is doing now, it is conservatively estimated that bovine tuberculosis could be practically eliminated from our cattle and hogs in 10 years.

EQUINE INFECTIOUS ABORTION[1]

By R. A. KELSER[2]

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THE SERIOUS MENACE of bovine infectious abortion to the cattle industry of the country has called forth the efforts of a relatively large number of research workers, and a considerable amount of work has been done with a view to improving our knowledge of the disease and means for its control. Comparatively little, however, is reported on equine infectious abortion, although notations of its occurrence are not infrequent. It is estimated that the annual colt crop of the United States amounts to approximately 2,000,000 animals, and I am of the opinion that if an accurate compilation of losses for the past five years due to infectious abortion were possible, the size of the figure would probably prove a surprise to a number of us.

According to Williams (1), equine infectious abortion was first recognized in the United States in 1886, when it made its appearance in several States in the Mississippi valley. Since that time its general distribution throughout the United States is indicated from reports of outbreaks in various widely separated sections of the country. It has been responsible for the loss of practically the entire colt crop of various horse-breeding sections during certain seasons. Extensive outbreaks of equine abortion are of more sporadic occurrence than bovine abortion, but the disease in mares runs an acute course and exacts a large toll in colts when once it appears.

For a number of years the etiology of equine infectious abortion was a more or less unsettled question, various investigators attributing it to different causes. Even now the organism incriminated by the majority of investigators as the causative agent is occasionally questioned.

Kilborne and Smith (2) in 1893 reported the occurrence of an outbreak of abortion in a large stud in Pennsylvania. An organism of the paratyphoid group, closely resembling the *Bacillus suipestifer* (hog-cholera bacillus), was isolated.

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[1] Presented at the Fifty-seventh Annual meeting of the American Veterinary Medical Association, Columbus, Ohio, August, 1920.

[2] Resigned September 7, 1920.

Ostertag (3) in 1901 called attention to an outbreak of equine abortion in Northern Germany and reported the isolation of a short streptococcus. His transmission experiments with the organism isolated were, however, with one exception, negative.

In 1905 Lignières (4) reported the isolation of an organism of the hog-cholera group in connection with a study of abortion in mares, sheep and cows, in France and Argentina.

Good (5) of the Kentucky Experiment Station in 1912 reported the isolation of an organism of the paratyphoid group from cases of abortion occurring in several studs in Kentucky, and was able to produce abortion in pregnant guinea-pigs with the organism. In 1916 Good and Smith (6) published a further article dealing with the etiology of the disease.

In 1912 De Jong (7) of Holland reported the results of his work with an organism of the paratyphoid group isolated from cases of equine abortion. He was able to produce abortion quite uniformly with the culture isolated.

In 1913 Meyer and Boerner (8) published on the etiology of an outbreak of equine abortion in Pennsylvania and described an organism of the paratyphoid group as the causative agent.

OUTBREAK OF INFECTIOUS EQUINE ABORTION AT ARMY REMOUNT DEPOTS

During the past winter (1919-1920) while the writer was in charge of the Army Veterinary Laboratory at Philadelphia, Pennsylvania, a rather extensive outbreak of equine infectious abortion occurred practically simultaneously at three of the army remount depots and afforded an excellent opportunity for a study of the disease and means for its control. This report is based chiefly on the work done during this outbreak.

The remount depots involved were located at Fort Keogh, Montana; Fort Reno, Oklahoma, and Front Royal, Virginia, and so far as could be ascertained there was no record of an interchange of animals between the three depots at any time immediately previous to the outbreak.

The disease was diagnosed at the Fort Keogh Remount Depot late in October, 1919, by the Central Department Laboratory, following several abortions in the brood mares at the depot. Cultures isolated were later forwarded to the Philadelphia Laboratory and were found to be identical in every way with those isolated from the cases at Front Royal.

At the Front Royal Remount Depot abortion became frequent in November, 1919, and in December, on account of the continuance of the trouble, which led to the suspicion that the condition was infectious, specimens were forwarded to the Philadelphia Laboratory and we were able to isolate an organism of the paratyphoid group which proved to be *Bacillus abortus equi*.

In February, 1920, the Southern Department Laboratory, employing an antigen prepared by the Philadelphia Laboratory from cultures isolated from the Front Royal specimens, obtained positive complement-fixation reactions with several blood specimens from aborting mares at the Fort Reno Remount Depot. Subsequent bacteriological examinations of utero-vaginal specimens resulted in the isolation of *B. abortus equi* quite uniformly.

A total of 93 known abortions occurred at these three remount depots during the outbreak; and inasmuch as mares in the very early stages of gestation may abort without this being detected, it is possible that the actual number of abortions even exceeded this figure.

Specimens from all mares that aborted were submitted to one of the three laboratories engaged in the work, for bacteriological examination. Further, numerous complement-fixation and agglutination tests were carried out with blood specimens from the aborting mares and from mares and stallions exposed to the infection.

THE ETIOLOGICAL FACTOR

The organism isolated uniformly throughout the outbreaks at all three of the above-mentioned remount depots corresponds in all essentials to that described by Kilborne and Smith, De Jong, Good, and Meyer and Boerner.

It appears as a short, rather stout rod, with rounded ends, varying from 0.4 to 1 micron in length and from 0.2 to 0.5 micron in width. The organism in smear preparations from specimens of discharge has a marked tendency toward bipolar staining. It stains well with the ordinary aniline dyes and is Gram negative. Hanging drop preparations demonstrate it to be actively motile. It is an aerobe and a facultative anaerobe and grows well at the usual incubator temperature of 37.5° C.

The growth on agar slants is very characteristic of the organism and serves as one of the chief points of differentiation between *Bacillus abortus equi* and closely related organisms of

the paratyphoid group. After an over-night incubation on such medium a moist, grayish-white growth appears. From this time on the growth rapidly takes on a dry, wrinkled appearance so that usually after 48 hours it is uniformly dry and wrinkled over its entire surface, and on removing part of it with a platinum needle it is found to be brittle and non-adherent to the medium. On agar plates, after 48 hours, individual colonies take on a granular and more or less wrinkled appearance. The whole colony can be slid intact from its position on the medium by pushing one edge of it with the platinum needle.

In our investigations it was observed that one culture of the organism did not take on this parchment-like characteristic when first isolated, but developed it in the third generation, that being its second culture on slant agar.

Milk is neither acidified nor coagulated. Gelatin is not liquefied. Bouillon is rendered turbid after 24 hours, followed by pellicle formation which readily sinks to the bottom of the tube on slight shaking. Indol could not be demonstrated after growth of the organism in Dunham's peptone solution.

Because of the disagreements in the reports of various investigators as regards the action of the organism on various carbohydrates, this property of the cultures isolated was studied with particular care, and special attention was given to the preparation of the different types of sugar media used, with a view to eliminating errors due to conversion of a particular sugar through the process of sterilization. This possibility was entirely eliminated by Berkefeld filtering the various carbohydrate media to sterilize them and then filling them into sterile fermentation tubes in the same manner as vaccines and bacterins are handled.

The following results were uniformly obtained with the carbohydrates employed in our work:

Dextrose	Acid and gas.
Maltose	" " "
Mannite	" " "
Dulcite	" " "
Lactose	Neither acid nor gas.
Saccharose	" " " "

We found, as has been noted by Meyer and Boerner, that a much larger amount of gas is produced by the organism in dulcite in 24 hours than in any of the other sugars employed.

TRANSMISSION EXPERIMENTS ON GUINEA-PIGS

Eight supposedly pregnant guinea-pigs were used in a transmission experiment. The pigs were divided into two groups, 4 receiving injections of a culture known as No. 100 and the remaining 4 injections of a culture known as No. 396, both cultures being isolated from specimens received from Front Royal. The results obtained were as follows:

Group I

Guinea-pig No. 1, ½ c.c. 24-hour bouillon culture No. 100. See Note A.
Guinea-pig No. 2, 1 c.c. 24-hour bouillon culture No. 100. See Note B.
Guinea-pig No. 3, ½ c.c. suspension 24-hour agar slant No. 100. See Note C.
Guinea-pig No. 4, 1 c.c. suspension 24-hour agar slant No. 100. See Note D.

Group II

Guinea-pig No. 5, ½ c.c. 24-hour bouillon culture No. 396. See Note E.
Guinea-pig No. 6, 1 c.c. 24-hour bouillon culture No. 396. See Note F.
Guinea-pig No. 7, ½ c.c. suspension 24-hour agar slant No. 396. See Note G.
Guinea-pig No. 8, 1 c.c. suspension 24-hour agar slant No. 396. See Note H.

Notes

A.—Aborted on sixth day following injection. Fetus partly eaten and decomposed. Pig chloroformed. *Bacillus abortus* from uterus.

B.—Chloroformed 14 days after inoculation and found nonpregnant.

C.—Aborted on eighth day following injection. *B. abortus equi* from fetus and uterus of mother.

D.—Aborted on fifth day following injection. Fetus eaten. Mother chloroformed following day. *B. abortus equi* from uterus.

E.—Aborted seventh day following injection. Chloroformed following day. *B. abortus equi* from uterus.

F.—Two apparently full-term pigs born on third day following injection. Lived two days. Mother chloroformed day pigs were born. *B. abortus* from uterus.

G.—Chloroformed nineteenth day after injection. Nonpregnant.

H.—Aborted on fifth day following injection. *B. abortus equi* from fetus and mother's uterus.

Thus out of the 8 guinea-pigs inoculated, 2 were found to be nonpregnant, 5 aborted and the organism was recovered, and 1 gave birth to 2 apparently full-term pigs, which, however, died on the second day and *B. abortus equi* was recovered from the uterus of the mother.

SYMPTOMS

Infectious abortion in mares runs a much more acute course than the disease in cattle, and the period of incubation in equines is apparently much shorter.

In mares which abort very early in gestation (within the first

two months, for instance) the abortion may occur without being noticed by the attendant, and usually without any disturbance whatever in the health of the mare. Animals in more advanced stages, however, may show indication of approaching abortion in the swelling of the vulva, vaginal discharge, uneasiness, etc.

In mares which have aborted an odor which Good refers to as a "sour odor," which term seems best to describe it, is noted with the fetus, fetal membranes and utero-vaginal discharge, and is quite characteristic of the affection.

An examination of the fetus and membranes usually shows numerous pathological changes. An autopsy of a seven-months fetus aborted by one of the Fort Keogh mares showed an extensive inflammation of the afterbirth and umbilical cord. The head, neck and thorax of the fetus were apparently normal; abdominal wall highly inflamed, the inflammation extending from the umbilicus over the croup down to the hocks; testicles inflamed; lungs and heart normal; liver and kidneys highly congested.

Abortions, as a result of infection with *Bacillus abortus equi*, appear to occur at any stage of the gestation period. Twenty-five fetuses aborted by mares at the Fort Keogh Depot, however, ranged from 2 to 7 months old.

"Joint-ill" of colts, commonly occurring in connection with equine infectious abortion, was not noted in connection with this outbreak, and so far as could be ascertained, no cases of this affection have occurred in colts born since the outbreak.

DIAGNOSIS

In the diagnosis of the disease, bacteriological examination of utero-vaginal discharge, and the complement-fixation and agglutination tests with blood specimens from aborting mares and exposed mares and stallions, were employed.

The technic of the complement-fixation test was that commonly employed in the diagnosis of glanders, with the exception that a 48 hour bouillon culture of *Bacillus abortus equi*, killed by heating at 65° C. for 1 hour, was employed as an antigen. Such an antigen proved highly satisfactory in every way.

The agglutinating antigen was prepared by growing the organism on glycerin-agar for 24 hours, washing the growth up in sterile physiological saline solution, heating 1 hour at 65° C. and diluting to proper density with carbolized salt solution..

It is desired to draw particular attention to the use of the serological tests in the diagnosis of equine infectious abortion. In our investigations it was clearly demonstrated that the complement-fixation and agglutination tests are not to be relied upon in diagnosing the disease in individual animals. These tests are, however, highly valuable in establishing the presence of the disease in a stud when a number of animals are tested. Positive reactions are usually clear-cut and are specific.

The negative reactions with such tests, in those animals which have aborted and from which the specific organism has been recovered, is undoubtedly due, in a large percentage of such cases at least, to the fact that the infection is localized, involving the fetus, fetal membranes, and of course the uterus more or less, but not involving the maternal tissues sufficiently to stimulate the production of agglutinins and complement-fixing bodies in detectable numbers. It is possible, too, that in some instances the period of incubation has been very short and the abortion occurs before antibodies have developed in sufficient numbers to be demontsrated by the laboratory tests.

A summary of tests carried out at the Front Royal Remount Depot illustrates very nicely the unreliability of the serological tests in diagnosing the disease in individual animals. Of a total of 18 mares which aborted as a result of infection with *Bacillus abortus equi,* 9 gave positive results to the complement-fixation test, 1 a suspicious reaction, and 8 entirely negative readings. The agglutination test checked with this with the exception that the one reacting suspiciously to the complement-fixation test gave a positive agglutination reaction.

TREATMENT AND PREVENTION

The treatment employed in connection with this outbreak was largely sanitary and consisted in the isolation of aborting animals and those positive or suspicious to laboratory tests, and proper disposal of fetuses, fetal membranes, and material contaminated with discharges. Mares which had aborted were irrigated daily with a solution of potassium permanganate or other disinfectant until the discharge had ceased. Infected stalls and corrals were sprayed with disinfecting solution and the manure was disinfected before removal. Different attendants were provided for the isolated animals and measures were taken

to prevent the dissemination of the disease through feeding and watering.

In checking the outbreak and preventing further losses most excellent results were obtained with bacterins, and from our experience with them I am convinced that this is probably the most effective agent at our disposal in controlling outbreaks of the disease.

Between February 12 and April 30, 1920, a total of 45 colts were lost at the Fort Reno Depot as a result of infectious abortion. The first bacterin treatment was given March 24, 1920, and repeated after intervals of 5 days until a total of 6 increasing doses had been administered. Approximately 300 animals were treated at this post. Abortion ceased after the second injection of bacterin, and up to July 7, 1920, 65 healthy colts were born and are reported as doing well.

At the Front Royal Remount Depot a total of 18 mares aborted between November 19, 1919, and March 3, 1920, as a results of the infection. Bacterin treatment was commenced March 9, 1920, and was completed early in April. Subsequent to the bacterin treatment no abortions occurred, and up to June 16, 1920, 21 healthy colts were born and are doing well.

At Fort Keogh between October 20, 1919, and January 25, 1920, 25 abortions occurred as a result of the disease. Bacterin treatment was commenced January 12, 1920, and was completed about March 15, 1920. A total of 278 mares and stallions were injected. Abortions ceased following the bacterin treatment, and while I have been unable to get the exact number of colts born to date, the results compare favorably with those obtained at the other two depots.

PREPARATION OF THE BACTERIN USED

The bacterin employed in this work was prepared by growing on glycerin-agar for 48 hours several strains of the organism isolated. The growth was then washed up with sterile physiological saline solution and heated at 65° C. for 1 hour to kill the organisms. This stock suspension was then standardized and diluted with phenolized salt solution so that each cubic centimeter contained approximately 2 billion organisms. This was termed "Bacterin A" and was administered to nonpregnant mares and to stallions, giving 6 subcutaneous injections 5 days apart, as follows:

First	dose, 1 c.c.,	2 billion bacteria.
Second	dose, 5 c.c.,	4 billion bacteria.
Third	dose, 3 c.c.,	6 billion bacteria.
Fourth	dose, 4 c.c.,	8 billion bacteria.
Fifth	dose, 5 c.c.,	10 billion bacteria.
Sixth	dose, 7 c.c.,	14 billion bacteria.

For pregnant mares a lot of "Bacterin A" would be diluted with an equal part of phenolized saline solution and termed "Bacterin B," and this was administered at 5-day intervals as follows:

First	dose, ½ c.c.,	500 million bacteria.
Second	dose, 1 c.c.,	1 billion bacteria.
Third	dose, 2 c.c.,	2 billion bacteria.
Fourth	dose, 3 c.c.,	3 billion bacteria.
Fifth	dose, 5 c.c.,	5 billion bacteria.
Sixth	dose, 8 c.c.,	8 billion bacteria.

The weaker bacterin was administered to pregnant mares because it was feared that heavy injections might produce reactions sufficiently great to induce abortion. Not a single case of abortion, however, was reported as a result of the bacterin treatment.

ANTI-ABORTION SERUM (EQUINE)

Several horses have been hyperimmunized to *Bacillus abortus equi* with a view to testing the value of serum from such animals in preventing abortion in mares far advanced in pregnancy. An effort will also be made to establish whether or not a single simultaneous injection of such serum and a large dose of bacterin can be used effectively against the disease.

The preparation of the serum was not completed in time to complete tests with it during the outbreak reported, but the Army is still conducting work with it and will undoubtedly make known any results obtained.

CONCLUSIONS

In conclusion there are just three points that I wish particularly to bring out:

1. That the results obtained during this outbreak further substantiate reports previously published by several investigators, incriminating a specific organism of the paratyphoid group as the cause of equine infectious abortion, and demonstrate the importance of the disease in connection with the horse-raising industry.

2. That the complement-fixation and agglutination tests, while

highly valuable in establishing the presence of the infection in a stud, are unreliable in diagnosing the infection in individual animals.

3. That properly prepared bacterins are highly efficient agents in preventing abortions due to *Bacillus abortus equi.*

ACKNOWLEDGMENTS

Finally I wish to acknowledge my indebtedness to Capt. C. C. Whitney, who conducted laboratory work in the Southern Department Laboratory in connection with the Fort Reno outbreak; to Lieut. F. H. Reynolds, who carried out laboratory work in the Central Department Laboratory in connection with the Fort Keogh situation, and to Captains Houston and Cook and Lieutenant Middleton, of the Fort Reno, Front Royal, and Fort Keogh remount depots respectively, for their coöperation and for data furnished.

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DISCUSSION

DR. FITCH: I would like to ask Dr. Kelser as to the action that he considers positive, what dilution of serum in agglutinations.

DR. KELSER: A reaction with a dilution of serum of from 1 to 500 to 1 to 1,000 can be considered suspicious. Anything that gives agglutinations over 1 to 1,000 solution is considered positive; 1 to 500 is considered negative.

Because of rinderpest which has recently occurred in Brazil, Uruguay and Argentina have placed embargoes on all livestock and feed shipments from Brazil. It is also stated that livestock from the United States shipped to Uruguay and Argentina will not be allowed to land if the boat stops at a Brazilian port en route.

THE ANIMAL PARASITES OF FOXES, WITH SPECIAL REFERENCE TO HOOKWORMS [1]

By WILLIAM A. RILEY *and* C. P. FITCH

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UNTIL recently the study of the parasites of foxes would have been regarded as a useless even though harmless diversion. They were not looked upon as of economic importance, and when considered at all were studied from the viewpoint of the systematist. Now, with the awakened interest in fur farming, and with the increasing value of skins, the condition is rapidly changing. When a choice fur may bring over a thousand dollars, and when breeding animals are valued in the thousands of dollars, a fox may be worth many times the value of a fine horse or cow. Any disease, parasitic or otherwise, which threatens the life of the animal, or which even affects deleteriously the condition of its fur, becomes of prime importance to the fur farmer.

It is a general assumption of those interested in the industry that foxes are remarkably free from disease. Whether this be true or not regarding wild foxes, we have not reliable data. Certainly there is no reason to suppose that it will prove to be so for the domesticated ones. Infections which in nature are scattered over wide areas become concentrated under conditions of confinement. The result is soil contamination, which sooner or later means trouble. The danger is especially grave in the case of infections with protozoan or nematode parasites which do not require an intermediate host to complete their development. In such cases the cysts, or eggs, or larvæ, may remain for months or even for years in the soil, capable of causing fatal epizootics when the conditions are favorable.

In November, 1917, there was brought to the Veterinary Division of the University of Minnesota a silver fox which had died from some unknown cause. The animal was in fairly good state of preservation, and examination showed large numbers of hookworms in the intestine. These were identified by Dr. B. H. Ransom as *Uncinaria polaris* Looss, 1911. The abundance of these worms in the first case examined and subsequent studies

[1] Published with the approval of the Director as Paper No. 248 of the Journal Series of the Minnesota Agricultural Experiment Station.

leave no room for question that they were the cause of the death of the fox. Later in November we examined feces from a number of foxes from this farm, with the following results: No. 1, large numbers of hookworm ova; No. 2, few hookworm ova; No. 3, very few hookworm ova; No. 4, no ova found; No. 5, many ascarid ova and a very few hookworm ova; No. 6, many ascarid ova; No. 7, few hookworm ova.

Subsequently a study of several lots of feces from three different fox farms in the State and examination of animals showed the presence of these parasites.

Available data regarding their presence elsewhere and the known facts concerning the source and distribution of breeding stock make it evident that the hookworm is widely distributed and a potential source of serious loss under insanitary conditions.

HOOKWORMS INFESTING FOXES

A considerable number of hookworms have been reported for the fox. When the synonomy of the group is considered, however, these resolve themselves into three species, *Ancylostoma caninum, Uncinaria criniformis* and *Uncinaria polaris.*

Ancylostoma caninum (Ercolani, 1859) Hall, 1913

Ancylostoma caninum is a common and widely distributed hookworm of dogs and cats. Under this name and various synonyms (notably *Uncinaria trigonocephala* and *Ancylostoma trigonocephala*) it has been repeatedly reported for foxes. Railliet lists as hosts *Vulpes vulgaris* (the common European fox) and *Vulpes lagopus* (the Arctic fox).

The most fundamental characteristic separating species of this genus from those of *Uncinaria* is the fact that the ventral margin of the large mouth capsule is armed with two strong teeth, the three points of which are bent backward (Fig. 1, *a*). The genital tubes are relatively very long and thin, forming short, close coils, which have a chiefly transverse course. These and similar characters can only be seen satisfactorily in specimens which have been cleared in glycerin (by slow evaporation of 70 per cent alcohol and 5 per cent glycerin) or in alcohol-carbolic acid mixture (80 per cent carbolic acid in absolute alcohol).

The female measures 9-21 mm. in length, the male 9-12 mm. The caudal bursa of the male is almost spherical, broader

than long, with large lateral and small dorsal lobes; ventral rays bifed, the lateral trunk deeply cleft; the dorsal ray long and ending in two digitate branches.

The eggs when discharged are in the early segmentation stages. In the presence of moisture and suitable temperature conditions these hatch in from three to six days. These larvæ undergo two moults before they become infective. From the time the eggs leave the host until the larvæ are ready to enter a new animal at least two weeks, usually longer, must elapse. The infective larvæ are capable of lying dormant in the soil for weeks and months.

It is well known that *Ancylostoma caninum* is the cause of serious disease in dogs and cats. Stiles, 1903, states that in some parts of this country it is responsible for the death of from 25 to 40 per cent of the pups born. There is no reason to suppose that in cases of heavy infestation the results would be any less disastrous to foxes.

Uncinaria polaris Looss, 1911

Hookworms belonging to the genus *Uncinaria* are immediately distinguishable in cleared specimens by the fact that the buccal capsule lacks the strong three-pointed teeth characteristic of *Ancylostoma.* Instead there projects from each side of the capsule walls a broad plate with cutting edge. The genital tubes are comparatively short and thick, forming few coils which run chiefly longitudinally.

The type material was from an Arctic fox, *Vulpes lagopus,* from the Zoological Park, Washington, D. C., and was sent by Dr. C. W. Stiles to Dr. Looss, who described the species. As the original description is practically inaccessible to most workers, we quote it in full and have also reproduced in Figure 1 such figures as Looss presented.

Uncinaria polaris Looss, 1911, p. 213, figs. 107-108, 117. Male 7-8 mm., female 10-11 mm. long. Mouth capsule (see fig. 1, *c*) somewhat wider and comparatively less slender than in the *Uncinaria criniformis;* the optical frontal sections of the cutting plates at the edge of the mouth lie much farther apart and only indistinctly present the appearance of "teeth"; the free edges of the plates are rounded. Boundary between the thicker dorsal portion and the thinner ventral portion of the mouth-capsule wall running in an almost straight line. Esophagus in male

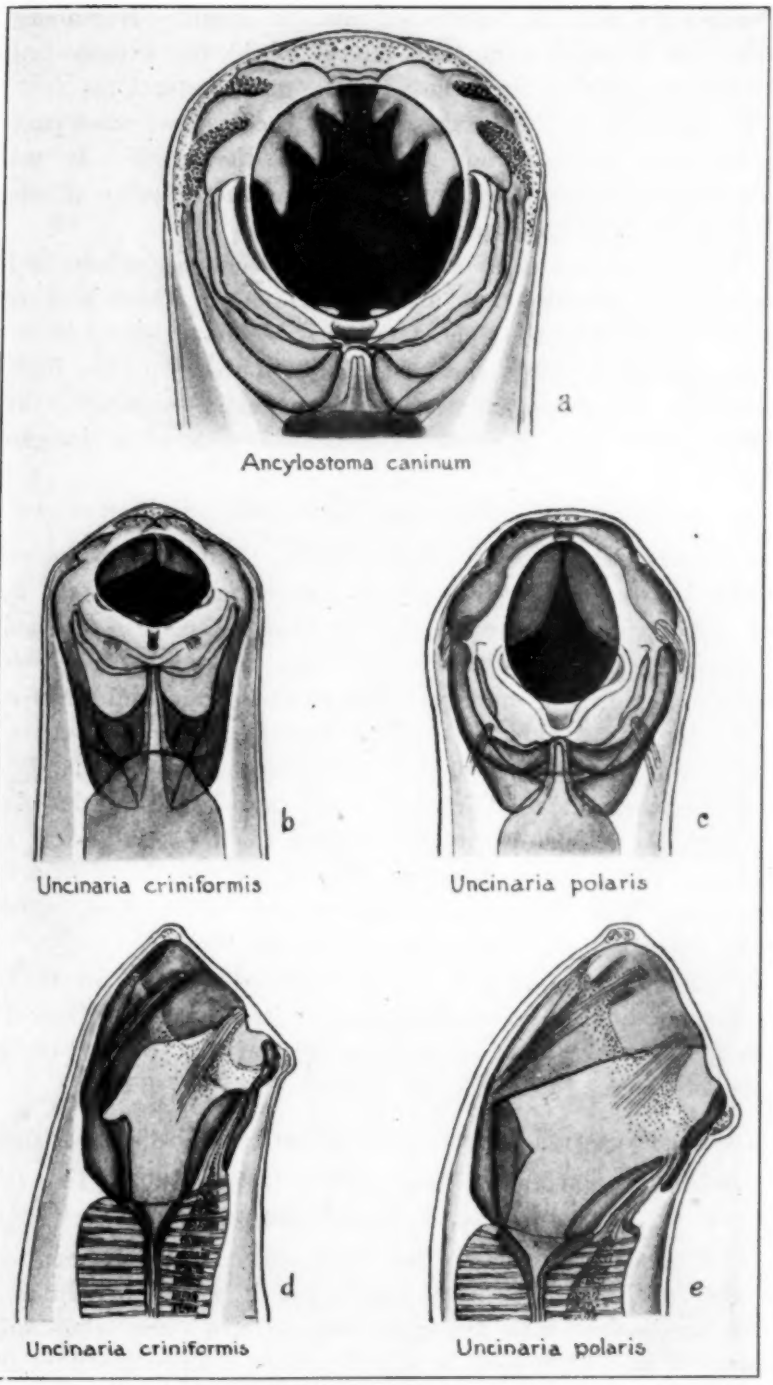

Fig. 1.—The three species of hookworms occurring in foxes. (Redrawn from Looss, 1911.)

averages 0.7 mm., in female 0.8 mm., in length. Bursa of the male (fig. 2) with very long lateral lobes; the externo-lateral ray slightly thicker than the adjacent medio-lateral ray.

The eggs (fig. 3, *a, b*), like those of *Ancylostoma caninum*, are in the early segmentation stages when discharged. In warm weather they develop rapidly, so they are usually in an advanced stage when found in the feces.

There is no reason to suppose that *Uncinaria polaris* is less serious as a parasite than are *Ancylostoma caninum* and other species of hookworm. The facts that we have found it in 24 foxes examined within the past year and that we have had information concerning its occurrence on widely separated farms clearly show that it must be reckoned with as a dangerous species.

Uncinaria criniformis (Rud., 1809) Railliet

Uncinaria criniformis (Rud., 1809) Railliet is more commonly known in the literature as *Uncinaria stenocephala* Railliet, 1884. It is somewhat smaller than *U. polaris*, the males averaging 6 mm. and the females 7 mm. in length. The mouth capsule (fig. 1, *b*) is narrower and more slender, and when seen from the dorsal side the optical frontal sections of the oral plates appear as sharply defined teeth directed toward the middle line, the tips touching each other. The free edges of the plates are rather angular; boundary between the thicker ventral portion and the thinner dorsal portion of the mouth capsule wall when seen from the side forming a doubly curved line, whereas in *U. polaris* it runs in an almost straight line.

Uncinaria criniformis has been repeatedly noted for the fox in Europe, but we know of no case of its having been found in this country. We have not had material of this species but have relied upon the description by Looss.

OTHER PARASITES NOTED IN FECES OF DOMESTICATED FOXES

Belascaris marginata (Rud., 1802) Leiper, 1907 (*Ascaris marginata, A. mystax* pro parte.)

This ascarid is probably the most common of the nematodes of the fox, though we have not found it as frequently as we have the hookworms. Its eggs (Fig. 3, *c, d*) are subglobular, about 85 by 75 microns in size, and are readily distinguished by the presence of a mammillated albuminous coat.

The fact that this ascarid worm causes serious and even fatal

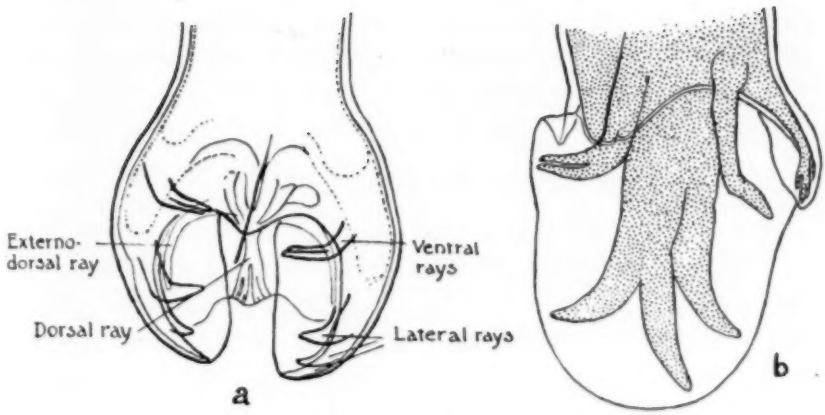

Fig. 2.—Uncinaria polaris. a, Dorsal view of bursa of male; b, Looss's figure of lateral view of bursa.

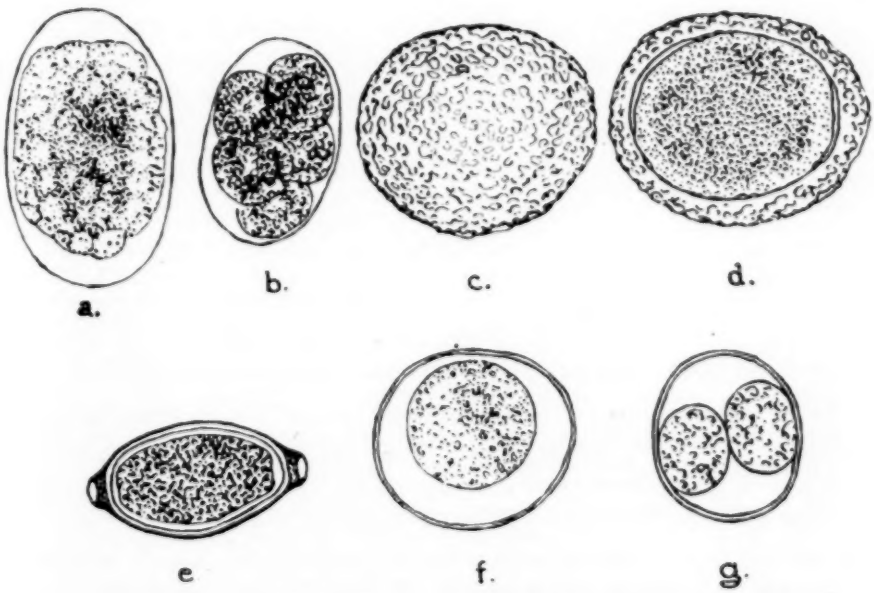

Fig. 3.—Eggs and cysts noted in our examination of foxes. a, b, Uncinaria polaris, shortly after discharge, X 340; c, d, Belascaris marginata, surface view and optical section, X 340; e, Trichocephalus depressiusculus, X 340; f, g, cysts of a coccidian, X 680.

effects in young puppies is a matter of common knowledge. Apparently the same disturbances are caused in fox puppies. While fox growers regard this worm as the most serious or even the only parastitic worm with which they are concerned, this idea is doubtless due primarily to the fact that the worm itself is sometimes to be found in the feces.

Trichocephalus depressiusculus Rud., 1809

The characteristic eggs (Fig. 3, *e*) of this whipworm were found fairly abundant in 2 out of 24 foxes examined. This same species is found in dogs. There is no evidence that it causes any serious trouble.

Coccidium bigeminum canivelocis

Under this name Weidman, 1915, has reported the finding of a coccidium in two Swift foxes from the Western United States. These foxes were in the Philadelphia Zoological Garden. Both animals showed diarrhea, the one more marked than the other. The more heavily infested animal died in about a week, though Weidman hesistates to conclude definitely as to the pathogenic nature of the parasite, without further data.

We have found four cases of infestation with a coccidium (Fig. 3, *f*, *g*) which agrees fairly closely with Weidman's figures and measurements. We are not yet ready to venture an opinion as to the species or its possible pathogenicity.

AVOIDANCE OF PARASITIC DISEASES

The conditions under which domesticated foxes must be kept render them peculiarly liable, sooner or later, to parasitic diseases which are contracted from contaminated soil. It is therefore essential that the most efficient possible measures be taken to prevent the introduction of parasites and to maintain sanitary conditions in the pens.

In view of the high prices of breeding stock and the heavy investment involved it would be the part of wisdom to require that a microscopic examination of feces of a prospective purchase showed freedom from animal parasites of known pathogenicity. More specifically, animals found infested with hookworms, ascarids or coccidia should not be accepted before being subjected to thorough medical treatment at the seller's risk. Where this is not feasible, the animals on being received should

be isolated for a few days, away from the regular pens, and should be carefully examined and if necessary treated.

In the construction of yards great care should be paid to drainage in order to avoid the passing of possible infections from pen to pen. For various reasons it is preferable to have the pens separated by a distance of a foot and a half to two feet, and this will allow side drainage.

The common practice of putting the wire netting floor directly on the surface of the ground is undesirable, since it does not allow thorough cleaning or satisfactory disinfecting of the grounds. Though the initial cost is greater, it is highly desirable to place this netting a full foot under the surface of the ground, if the soil is reasonably loose. When the netting is well sunken the soil may be cleaned, disinfected or renewed.

There is no chemical, fluid or powdered, which can be counted upon to destroy parasitic eggs in the soil. Some which are highly recommended do not even retard the development of parasitic eggs placed directly in them. We believe that the most practicable method of disinfection is the burning over of the ground by a spray of burning oil, as practiced by economic entomologists in the fight against certain injurious insects, such as the gypsy moth and the imported cornstalk borer. The value of this method was first pointed out by Stiles, 1902, who quotes from the report by Forbush and Fernald, 1896, on "The Gypsy Moth":

> Experiments were made with the cyclone nozzle. An oil spray from this nozzle when ignited was found to give a very hot and effective flame. Crude oil was first used as a burning fluid, but as it is very objectionable on account of its rank odor, paraffin gas oil was substituted later. This oil has less odor and burns to better advantage, but is somewhat more expensive. A 15-gallon tank, which could be readily carried about by two men, was provided. On such a tank a Johnson pump with a fine strainer placed over the suction pipe, was mounted and a short hose of the kind made for the delivery of oil was attached. Ordinary rubber hose is worthless for such a purpose, as it is soon destroyed by the corrosive action of the oil, and in the meantime the disintegrated particles frequently clog the nozzle. A pole, consisting of an iron pipe 12 feet long, braced by being surrounded by wood for three-fourths of its length, was coupled to the hose. No solder could be used in the fittings of the pipe or nozzle, as the fierce heat of the flame would fuse it. The wooden cylinder into which the pipe was thrust was 1¼ inches in diameter. The wood being a nonconductor of heat was of great convenience in handling the pole. The end of the pipe was fitted with a cyclone nozzle. The aperture of this nozzle is very small, hence the value of the strainer before mentioned, which prevents the entrance of foreign substances with the oil, and a consequent clogging of the nozzle. The two men handling this apparatus filled the tank with oil and then carried it

to the spot where the burning was to be done. One man then operated the pump while the other handled the pole and nozzle. As soon as the pump was started a fine spray of oil was thrown into the air and ignited by a match. By means of the pole the resulting fierce flame was carried among the undergrowth and over the ground, destroying every living thing in its path. When this work was carefully done no eggs escaped, except such as were hidden in ledges or holes in the ground. An attempt was also made with this apparatus to destroy eggs which had been deposited in stone walls. Though this was partially successful, in so far as the fire reached and destroyed most of the eggs, those which were deposited under the lower stones of the wall were unharmed, even though in many cases the stones were cracked and broken by the heat. As it sometimes became necessary to use this apparatus in burning out walls near growing crops, a sheet-iron screen was set up between the flame and the growing vegetables to protect them from the heat, being moved along the wall as the work progressed. Burning was thus done without any resultant injury to the gardens. This machine, which has been named the "cyclone burner," would be most useful in checking invasions of crawling pests, like the army worm.

Dr. Stiles concludes:

It is understood, of course, that burning with a flame of this kind will disinfect only the surface of the ground, unless the flame is held in one place for some seconds or minutes.

Complaint has been made that there is a high mortality from uncinariasis among high-bred pups. The use of this flame in kennels ought to reduce this mortality practically to nothing, and I see no reason why the same general method of disinfection, modified to suit the particular conditions at hand, should not be used on the seal rookeries and fox farms of the Alaskan islands.

It has been objected that the use of this method would destroy the galvanizing of the wire floor of the cage. This, of course, applies only to cases where the wire is on the surface, a condition which, as we have already emphasized, is undesirable.

SYMPTOMATOLOGY

From the results of the examinations of the feces of foxes from a number of farms and the reports in literature, we are led to believe that hookworm infestation is quite common. On the other hand, the results obtained by Hall, who examined the intestines of 18 Alaskan foxes from St. George Island, were absolutely negative. Not a single specimen of hookworm was found in these animals.

The common symptoms of hookworm infestation are unthriftiness denoted by emaciation, poor coat and general cachexia. These conditions are produced by many other things than hookworms, and the only sure method of making a positive diagnosis is by means of a feces examination.

MORBID ANATOMY

The lesions found on autopsy in hookworm infestation are not usually extensive. The natural body centers of fat are largely depleted; emaciation may be extreme. Hair thin and lusterless. Liver, spleen and kidneys show no gross anatomical changes. Occasionally terminal pneumonia may be found. A more or less extensive gastro-enteritis is present, depending on the severity of the infestation. This is usually chronic catarrhal in type. It may also become hemorrhagic, especially in heavy infestations. Microscopical preparations from the various organs show various degrees of parenchymatous degeneration and occasionally fat. The worms are easily found if a little care is used. Autopsy should, however, be performed as soon after death as possible.

TREATMENT

The fox rancher has found that there are already on the market a number of proprietary preparations for treatment of foxes affected with intestinal parasites. Undoubtedly most of these contain santonin combined with other agents as calomel, castor oil, charcoal, sodium bicarbonate, etc. We have understood that the results obtained in the use of these agents have in some instances been satisfactory, but we have no way of knowing how badly infested the treated animals really were.

Hanson recently has recommended the following for treatment of foxes infested with hookworms and tapeworms:

> For vermifuge treatment, I would recommend that you fast the animals for 12 hours, and during this period of fast, administer about 2 drachms of Epsom salts in 2 or 3 ounces of a mixture of water and sirup. At the end of the 12-hour fast, administer in capsule the following: Ten grains each of thymol (ground very fine) and milk sugar. In two more hours repeat the administration of the same amount of thymol and milk sugar in capsule; two hours after the second dose of thymol and milk sugar, administer 2 drachms of Epsom salts in 2 or 3 ounces of water. Repeat this treatment in about two weeks and at monthly intervals thereafter. Any fox showing severe diarrhea or other serious intestinal disorder should not be administered large doses of vermifuges because an animal in such shape can not withstand severe vermifuge treatment.

Hall states as follows:

> Oil of chenopodium is being used in human medicine to a great extent against hookworms. It will remove hookworms from the dog also, but not with the same certainty and efficacy that it displays against ascarids. If chenopodium is used against hookworms in dogs, it would be advisable to repeat the treatment weekly, using the same dose as for ascarids. It would be inadvisable to repeat oftener than once a week, as the digestive tract in hookworm cases is already

suffering from the attacks of the worms and is in no condition to stand too much additional irritation. The number of treatments should be based on consideration of the patient's condition, or on fecal findings, or on both things. Chloroform in amounts two to three times as great as the dose of oil of chenopodium is more effective against hookworm than is the chenopodium, as Hall and Foster, 1917, have shown.

It is difficult to administer any medicinal agent to a fox, and treatment prescribed must conform to practical as well as theoretical principles.

In the work with human hookworm disease many experiments have been performed as regards the use of purgatives and food in relation to the efficiency of the vermifuge. Very lately Darling and Smillie as a result of their experiments on a coffee ranch in Brazil came to the following conclusions:

1. A preliminary purge does not add to the efficiency of the treatment with chenopodium, when the drug is given in two doses, 1.5 c.c. being considered the adult dose.
2. A preliminary starvation period is not necessary in the treatment of hookworm disease with chenopodium in divided doses of 1.5 c.c.; on the contrary, efficiency of the chenopodium is lessened.
3. A small amount of food given coincidently with the drug, when the chenopodium is given in divided doses of 1.5 c.c., greatly diminishes the efficiency of the drug in the treatment of hookworm disease.
4. In the smaller doses of chenopodium that are given children, the decrease in efficiency of chenopodium caused by the factors of preliminary purge, starvation period and food is much more striking than in the full adult dosage of 1.5 c.c.

Hall has pointed out that castor oil is quite satisfactory as a purgative, not only because of its cathartic properties, but because of its protective action as well. "It will save the lives of animals receiving lethal doses of oil of chenopodium when administered with the drug or an hour later."

Thymol has been used quite extensively in the treatment of hookworm disease in dogs. The use of this drug has largely given way to oil of chenopodium. Dogs have been given from 5 to 60 grains, followed by a saline purge.

We are confident that in the treatment of hookworm disease of foxes the most practical method is the use of oil of chenopodium. This should be placed in capsules and given in doses of 1 to 3 minims. These capsules should be embedded in a piece of meat. They are small and the fox "gulps" his food, and no effort is required to administer them. A small feeding should be given about one or two hours before the administration of the oil. Four hours after the dose of oil a large feeding of liver should be given. Liver acts as an excellent cathartic for foxes

and at the same time the foxes take it readily. Extreme care must be taken in regard to the dose. A layman must appreciate the absolute necessity of using the proper dose, or mortality may result.

Care must also be used not to administer as large doses to weak and emaciated animals. The microscope should be used to determine the relative amount of infestation both before and after treatment. This treatment should be repeated after ten days.

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"Draft Horse Future Looks Brighter" is the title of an article in *Wallaces' Farmer*, by Carl N. Kennedy, who states that there are two fundamental factors that should encourage horse breeding at the present time—that production has not kept up with the need of stock for replenishment, and that the present price of feed reduces materially the cost of upkeep.

The announcement that the Chicago Board of Trade has just appropriated $2,500 to further the work of the Horse Association of America is of far-reaching significance. It means that the greatest grain market in the world has recognized the menace from the displacement of horses and mules by motors.—*American Horse Breeder.*

THE ANTHELMINTIC VALUE OF DISTOL AGAINST HOOKWORMS [1]

By PROF. DR. T. MAREK

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SINCE 1912 the author has made systematic researches concerning the anthelmintic treatment of diseases caused by endoparasitic worms. The first series of these experiments was terminated by the publications on the successful treatment of distomatosis or liver fluke disease with distol in 1916 and 1917.[2] Afterwards the researches were extended to other diseases caused by gastrointestinal worms, but only the experiments concerning the removing of hookworms are in shape for publication. In the years 1916 to 1919 several American investigators undertook very important researches along this line and published their results in the JOURNAL OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION. Especially the experiments of Hall, Hall and Foster, Hall and Wigdor, Hall, Wilson and Wigdor, and Hall, Snead and Wolf, and the researches of Dove must be mentioned. All these researches being published during the war, they became accessible to me only recently. Consequently it might be not without interest to compare the results of the researches made independently in the same field of investigation by the author.

According to the results of the American authors, there is at

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[1] Distol is a proprietary remedy, which, according to papers by Marek, Opperman and Reisinger, was developed by Marek as a result of his tests of kamala and of male fern in the treatment of liver fluke disease of sheep and cattle. It is a male fern preparation, said to be a definite chemical substance with well-defined physiological properties, lipoid-soluble, and marketed in gelatin capsules in a lipoid base. It is said to be effective against the common liver fluke, *Fasciola hepatica*, in both sheep and cattle, but is ineffective against the lancet fluke, *Dicrocoelin dendriticum* (=*D. Lanceatum or D. lanceolatum*). While the exact composition of this product is not stated, the active substance being referred to as "Filixstoffe" (*i. e.*, a male fern product), something of its nature may be surmised from what is already generally known in regard to male fern. The active properties of male fern are contained in variable amounts in the oleoresin, which consists of a volatile oil, a resin, coloring matter and certain other substances. Among these other substances are filicic acid, flavaspidic acid, filicin, albaspidin, aspidinol and filmargn. According to French authorities, male fern should contain 24 to 25 per cent of filicin and 3.5 per cent of filicic acid for use in liver fluke disease. Kraft regards filmaron as the active anthelmintic constituent of male fern. Filmaron is a bright yellowish-brown powder, insoluble in water, difficulty soluble in cold alcohol, but very soluble in other general solvents; its formula is C47 H54 O16. The rhizome contains about 5 per cent of filmaron.—M. C. H.

[2] Marek. Die Leberegel krankheit, ihre Behandlung und Bekampfung. Berlin Tierarztl. Wchuschr., 1916, 73-101.

Marke. Ertolgreiche Behandlung des Leberegelkrankheit. Deut. Tierarztl. Wchnschr., 1917, Nr. 31, 33-35.

this time no drug known to be absolutely efficacious against hookworms in dogs. The relatively best effect was obtained (an efficacy of 85 to 91 per cent of the worms) with a mixture of chenopodium oil with chloroform, when administering one dose of 0.1 mil of chenopodium oil per kilo in soft or soluble elastic gelatin capsule and immediately afterwards 8 drams of castor oil with 0.2 mil of chloroform per kilo. The same result was observed after administering 3 doses of 5 or 10 minims of chenopodium oil in soft gelatin capsule at hour intervals, followed immediately each time by a dose of 15 mils of castor oil, and followed 1 to 1½ hours after the last dose by a dose of 4 mils of chloroform in 15 mils of castor oil. The effect was also fairly satisfactory when administering chenopodium oil with chloroform in the same capsule in doses repeated for several days. Santonin had no effect at all. Hermann's mixture and petroleum benzin seemed to have some successful effect too.

In 1917 hookworm disease of cattle (bunostomiasis) appeared in Hungary in an enzootic way in a stock of 85 yearling calves, and within one month 12 animals died and 10 were killed.[1] Two sick animals and, from time to time, feces of the calves left at home were sent to the clinical hospital of the Royal Veterinary College at Budapest. One of the two calves sent for observation died during the 5 days of railway transport. On autopsy emaciation, anemia and a dropsical condition and 4,213 hookworms in the small intestine, chiefly in the duodenum, were found. In order to establish the approximate number of hookworms possibly present in the intestine of an infected animal, the hookworm eggs found in 10 microscopic preparations of a dilution in water of the feces in the rectum of the dead animal and the hookworms found in its small intestine were counted. In this way it was possible to ascertain the approximate numerical proportion between the number of hookworm eggs and the number of worms living in the intestine of the same animal. By this proceeding it could be established that to each 5 eggs in 10 preparations of the feces made with double the amount of water there were approximately 100 hookworms in the alimentary canal.

Since the experiments made with distol in cases of distomatosis showed the reliable efficacy of this remedy against the liver

[1] Csontos and Pataky. Dochmiasis (Bunostomiasis) bei Rindern in Ungarn. Deut. Tierarztl. Wchnschr., 1918, p. 277.

flukes, I gave to the animal that remained alive and was estimated to have about 540 hookworms 3 doses of 4.5 grams of distol at intervals of 23 and 8 hours. From the time of administering the third dose of distol the feces were collected and examined for worms. In 3 days 402 dead hookworms were found. This amount corresponds quite well with the estimated number based on the numerical proportion between the worm eggs in the feces and the worms in the intestine, especially when we take into consideration that one part of the worms removed was probably not counted, since after the first and second doses of distol the feces were not examined. The day after the examination of the manure only 3 hookworm eggs were found in each 10 preparations of the feces. During the further observation of 2 months no more hookworm eggs could be detected. The weight of the animal at the beginning of the treatment, 135 kilos, increased within 10 weeks to 190 kilos. The blood content of hemoglobin rose from 25 to 50 degrees and the number of red corpulscles from 3,305,000 to 8,165,000. Consequently it is concluded that the animal had been freed from all hookworms and could be regarded as perfectly cured.

Microscopic examinations of the feces of the other animals left at home showed an amount of 2 to 62 hookworm eggs per 10 preparations. From that statement the conclusion could be drawn that together with slightly infested animals there were others which had 1,000 to 1,200 or more hookworms in their alimentary canals. Thereupon distol was given to the whole stock of young cattle, to the heavily infected animals 2 doses, to the slightly ill ones only one dose, to find out whether one dose or two doses were as effective as three doses. After administering the remedy a great number of hookworms were passed and a fortnight later microscopic examination of the feces of those animals which received 2 doses showed no hookworm eggs at all. The other animals receiving only one dose were found to have 1 to 5 hookworm eggs and in one case the same number of eggs as before, 47, was found. Thereupon two doses of 4.5 grams of distol were given within 24 hours to all infested animals, especially those which received two doses before. A fortnight later all animals were found to be free from hookworm eggs with the exception of one which had 47 worm eggs after the first treatment and in the feces of which only one hookwork egg could be detected after the second treatment.

According to these researches it can be said that hookworm disease of cattle can be cured surely with distol within a few days. Two doses proportioned to the weight of the animal (to 120 kilos 3 grams and for every further 50 kilos 1.5 grams more) will probably be sufficient, but to insure perfect efficacy it is advisable to give 3 to 4 single doses without a purgative.

In the dog I had only 3 cases of hookworm disease treated with distol. A fox terrier had suffered for a long time with a slight hemorrhagic diarrhea and his general condition was very bad. The microscopic examination of the feces showed the presence of hemoglobin and hookworm eggs. The dog was given 0.04 gram of distol in a gelatin capsule, whereupon an intensive diarrhea soon appeared and 2 dead hookworms were found in the feces. During the following weeks microscopic examinations were made repeatedly but no hookworm eggs could be detected. The blood-colored appearance of the feces ceased immediately and no hemoglobin could be found in them. The general condition improved considerably in a very short time.

In the feces of a pointer 5 hookworm eggs were counted to each 5 preparations, whereupon a dose of 0.04 gram of distol was given in a gelatin capsule. No hookworm eggs could be detected in the feces afterwards, and several weeks later on autopsy no hookworms were found in the alimentary canal.

The third case was a wolf-hound. On microscopic examination of 5 watery preparations of the feces 6 hookworm eggs and 7 whipworm eggs were found. After administering 0.04 gram of distol per kilo a copious diarrhea appeared but without hookworms in the feces. Ten days later the microscopic examination of 10 watery preparations of the feces showed no hookworm eggs. The same finding was obtained 2 months later.

Though the efficacy of distol in the dog could be confirmed by autopsy in only one case, the instantaneous disappearance of hookworm eggs in the feces proves the perfect efficacy of the remedy in these cases also. The distol kills the hookworms probably by way of the blood sucked in by these parasites, because other non-blood-sucking parasites, as bots in the stomach of horses, *Strongylus rubidus* in the stomach of pigs, and ascarids are not affected by the distol at all.

CARBON TETRACHLORIDE FOR HOOKWORMS IN DOGS

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IN A PAPER prepared for the *Journal of Agricultural Research* [1] the writer has reported in detail some experiments on dogs from which it appears that carbon tetrachloride is the most effective drug we have for the removal of hookworms. For the purpose of bringing the matter to the attention of the veterinarian this note is published here.

HISTORICAL

Carbon tetrachloride received more or less attention in human medicine about the years 1864-1865. It was found to be of value as an anesthetic and anodyne. It gave excellent results when administered by inhalation in child-birth, relieving the pain wholly or to a large extent and not diminishing the uterine contractions, in which connection it apparently deserves restudy. It was also found to be of great value in relieving pain from headache, dysmenorrheal distress, tic douloureux, toothache, hay fever, nervous exhaustion, etc. Finally, it was successfully used in surgical operations, with no fatalities, but, apparently because some investigators regarded it as more depressant to the heart than chloroform is, a statement which has subsequently reappeared regularly in the Dispensatory, carbon tetrachloride has been neglected as a drug for the last half century.

The writer has administered the drug by mouth to 30 dogs and has found no evidence antemortem or postmortem of injury to the heart or other organs as a result of ingestion of the drug. The only symptoms noted were in a case where a dose at the rate of 0.5 m.p.k. (mil per kilo) was given without the use of capsules and was promptly followed by evidence of intoxication as a result of inhalation, the dog recovering in the course of about 5 minutes. Nothing resembling the acute yellow necrosis of the liver in delayed chloroform poisoning has been noted,

[1] Jour. Agr. Research, vol. 21, no. 1, Apr. 15, 1921.

even in doses more than five times the chloroform dose producing this or in doses five times the dose of carbon tetrachloride found to be effective as an anthelmintic. However, repeated inhalations of the drug have been reported as causing toxic jaundice, and from its similarity to chloroform in composition some injury to the liver is to be expected, and Dr. Ch. Wardell Stiles tells me that it does cause some injury.

ANTHELMINTIC EXPERIMENTS

Carbon tetrachloride was administered to 30 dogs, either alone or combined with thymol or with chenopodium, in capsules or without the use of capsules, in doses of from 0.1 m.p.k. to 1.5 m.p.k. Where it was given without the use of capsules or in doses of less than 0.3 m.p.k., it was found to be uncertain in its efficacy. Where it was given in hard gelatin capsules in doses of 0.3 m.p.k., it was more effective in removing hookworms from dogs than any drug or combination of drugs which the writer and his collaborators have tested; it removed all the hookworms from 9 infested dogs, and in 5 other cases where hookworm eggs were found in the feces before treatment no worms were found postmortem. Unfortunately in these 5 cases no worms were found in the feces after treatment, so the evidence in these cases is less satisfactory than could be wished. However, it is to be expected that hookworms will occasionally be missed in the collection by an attendant of feces from a concrete floor 15 feet square, and it should also be noted that carbon tetrachloride is one of the drugs which is destructive to hookworms, the worms being more damaged with this drug than with any other drug the writer has used on dogs.

A combination of thymol, 10 grains, dissolved in carbon tetrachloride, 1 mil, administered at the rate of 0.3 m.p.k., and a combination of oil of chenopodium, 1 mil, dissolved in carbon tetrachloride, 3 mils, administered at the rate of 0.3 m.p.k., were likewise 100 per cent effective in removing hookworms from infested dogs when the drugs were administered in capsules.

Further experiment is necessary to determine whether carbon tetrachloride is sufficiently good to assure this 100 per cent effectiveness as a general rule without reinforcement with thymol or chenopodium, but if necessary the combinations may be made and are evidently very effective.

In three cases where the drug was given in doses of 0.1 to

0.3 m.p.k., no feces were passed in the next 24 hours, but the dogs showed no evidence of intoxication. However, the drug is evidently not constipating, as four dogs given 1 to 1.5 m.p.k. passed feces in the following 24 hours.

In comparison with other anthelmintics used for the removal of hookworms, including chloroform, chenopodium, chloroform and chenopodium, and thymol, it appears that carbon tetrachloride is distinctly more effective than chloroform plus chenopodium, the drugs which have heretofore given the best results in experimental tests on dogs. Care must be taken to secure pure carbon tetrachloride, not containing carbon bisulphid or carbonyl chloride (phosgene).

CONCLUSIONS

The findings to date indicate that carbon tetrachloride given in capsules in doses of 0.3 m.p.k. is superior to any drug heretofore tested in removing hookworms from dogs. Incidentally, it is only a little less effective than chenopodium in removing ascarids. The failure to develop symptoms, except in the one case noted (from inhalation), or lesions of any sort in 30 dogs, of which 29 were examined postmortem, the other dog being still alive and well two months after a dose of 1 m.p.k., is taken as evidence that the drug is reasonably safe, at least when administered in capsules to avoid effects due to inhalation.

Dr. Alonzo E. Taylor, chief of the division of research of the American relief administration, who is at Berlin after having completed a tour of the areas receiving American relief, has declared that in his opinion no more cows should be sent to Germany. Germany has about 8,000,000 cows and feed for about 6,000,000. He stated that because of the scarcity of fodder the German cows are below the normal milk yield.

France has now more cows and oxen than ever before, according to cable from Consul General Thackara, at Paris. There are now 12,755,000. The nearest to this number occurred in 1913, when there were 12,668,000. Sheep have fallen off from 14,038,000 in 1913 to 9,376,000 now and swine from 5,026,000 to 4,585,000. Horses have increased 2,205,000 to 2,413,000.—*Journal of Commerce.*

THE INTERNAL PARASITES OF THE HORSE IN NEVADA

By LEWIS H. WRIGHT[1]

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VERY LITTLE has been published regarding the actual distribution of the internal parasites of the horse in the United States. It is well known that they are well distributed throughout the country, and nearly everyone is aware of the enormous damage from emaciation, anemia, intestinal and circulatory troubles or indirectly by lowering the vitality of the animal and thus making him easily susceptible to a multitude of ills.

These observations are based on 60 animals autopsied and a number of other animals that were given a vermifuge and the parasites found. Nearly all of the animals were from the northern half of the State and about 50 per cent of them from the territory surrounding Reno. The animals were of all ages, and most of them had been used for general ranch purposes, but a few were horses used around the city and some were colts that had never been off the ranch. Many of the animals observed were suffering from some general disease or had been used for experimental purposes. These conditions should have in no wise affected the parasitic condition. It is impossible, however, to state how much the parasites affected the other condition or conditions.

The parasites looked for were *Gastrophilus, Ascaris, Strongylus, Cylicostomum, Œsophagodontus, Gyalocephalus, Triodontophorus, Oxyuris, Setaria* and *Anoplocephala.* The *Setaria* are not strictly intestinal parasites, but are mentioned here because of their rather wide occurrence.

GASTROPHILUS

These are among the most common parasites of the horse. Because of their almost always being present, they have been accused of causing many ills of the horse. From our observations they cause little harm unless present in large numbers. It must be admitted, though, that even small numbers can cause considerable local irritation.

Three species of *Gastrophilus* have been found, namely: *G.*

[1] Resigned June 1, 1920.

haemorrhoidalis, G. nasalis and *G. intestinalis. G. nasalis* has been found to be the most common, occurring in 80 per cent of the animals. *G. haemorrhoidalis* and *G. nasalis* occur in about equal numbers, being found in about 20 per cent of the animals. About 7 per cent of the animals did not have any *Gastrophilus.* Approximately 7 per cent had two or more species, and two had all three. *G. nasalis* are present in greater number as well as percentage. In one animal as many as 1,030 *G. nasalis* have been counted. It is possible that some were overlooked, as only the stomach and duodenum were searched.

Gastrophilus nasalis have been found to be attached almost entirely to the pyloric end of the stomach and the first portion of the duodenum, and occasionally one is found attached at some place farther back in the intestinal tract, apparently having become detached from its pyloric attachment and attaching itself where it could in the intestines. *G. haemorrhoidalis* and *G. intestinalis* have always been found attached to the cardiac portion of the stomach. They have not been found wandering elsewhere, as reported by some observers.

The only animal that has been considered harmed materially was the one that had 1,030 parasites. This was a four-year-old gelding in a very unthrifty condition. He was emaciated, very weak, anemic and listless. (See figure 1.) A careful physical

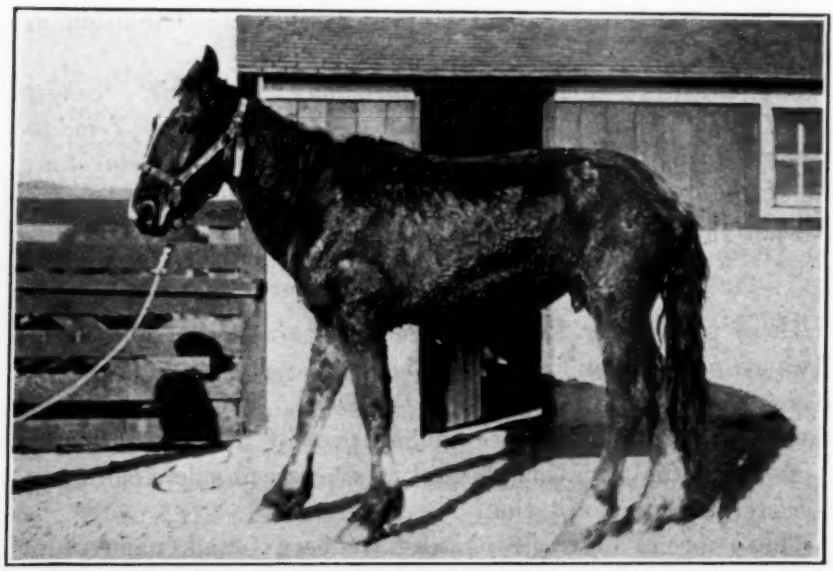

Fig. 1.—Four-year-old gelding that had over one thousand Gastrophilus spp. in the stomach and duodenum

examination, blood count and blood inoculation eliminated other diseases, so it was considered that the *G. nasalis* were the cause of the animal's condition. The animal became too weak to stand, was killed, and the parasites were found and identified.

The bot-fly may be of considerable annoyance to animals when at work or grazing. A highly recommended treatment for *Gastrophilus* is 16 to 24 mils of carbon bisulphide in a capsule per os followed in a few hours by a purge of raw linseed oil or an aloes ball. This treatment has been used experimentally in a number of cases. The animals were treated, the feces watched for parasites, and then the animals autopsied gave a check on the treatment. It was found that after a 24-hour fast the treatment was almost 100 per cent effective in all cases. In some animals not properly fasted the treatment was not successful. The success of the treatment depends to a great extent on the fast. The stomach must be nearly empty. The purge can be omitted, but it should not be. The aloes ball is apparently as satisfactory to use as the oil, is cheaper and easier to administer.

ASCARIS

Ascaris equorum has been found in only 10 per cent of the animals autopsied. The largest number found in any individual animal was 20, the least 1, and the average 6. From these observations *Ascaris equorum* is rare in this State. Because of their scarcity they cause little or no harm here. The two animals that were treated were given the carbon bisulphide treatment as for *Gastrophilus,* with 100 per cent success. Possibly a good purge would have worked equally as well. The material was not available for further observation.

STRONGYLUS

The three species of *Strongylus,* namely, *S. vulgaris, S. equinus* and *S. edentatus,* have been found in abundance. These worms are blood suckers, but from the ingesta found in their digestive tracts they apparently feed on the intestinal content to some extent. Blood, however, is most likely their main food supply.

Strongylus vulgaris is found strongly attached to the mucous membrane of both the cecum and the colon, principally around the ileo-cecal and ceco-colic openings. The immature forms are the cause of the verminous aneurism of the anterior mesenteric

artery. They have been found in 90 per cent of the animals over one year of age. These aneurisms have also been found in the branches of the anterior mesenteric artery, the posterior aorta and the iliacs. In over half of the aneurisms live forms of the worms have been found. Usually the artery is enlarged from only very little to twice its natural size, although in a few cases it has been found to be 15 to 25 cm. in diameter and as long. In medium-sized horses these aneurisms can usually be felt on rectal examination, especially if at all large.

In only a few instances can they be proven to cause trouble. It is not often that they cause digestive disturbances, colic, etc. They may cause weakness of the hind limbs and lack of stamina. It is almost impossible to say absolutely that they are the actual cause of the trouble, regardless of how much one may theorize on the subject. No doubt they do cause some of the digestive troubles of the horse, and from the size of some of the aneurisms it is a wonder that they do not cause more trouble. As far as is known, there is no cure for these aneurims. Sodium cacodylate has been given in many instances, but with no appreciable effects. No other parasite than *Strongylus vulgaris* has been found in these aneurisms.

Stongylus equinus has been found in 75 per cent of the animals. They are usually found in the colon, but are also found in the cecum and are strongly attached to the mucous membrane. In a number of instances *S. equinus* have been found free in the abdominal cavity.

Strongylus edentatus has been found in 40 per cent of the cases. It is also well hooked to the mucous membrane, but more quickly loses its hold after the death of the animal. The parasites are usually found in the colon.

The mode of infestation of these strongyles is not definitely settled, but from our observations it is direct—that is, by a susceptible animal (and all animals are susceptible) ingesting food and drink contaminated by the feces of another animal harboring the parasite. Later developments may indicate an intermediate host, but apparently the eggs are passed to the feces, the larval stage is started in damp places, and the larvæ are ingested by the other animal. Apparently there is no reason why an animal may not reinfest itself. This point is well worth considering in the control of the worms.

Before one can be positive that strongyles are the cause of

disturbances in horses, other conditions must be carefully eliminated. Just because on autopsy a large number of these worms are found is not enough to establish them as the cause of the trouble. Some of the most healthy horses harbor an enormous number of the worms, while others that have only a few are apparently greatly injured. In the latter, however, there might have been some obscure cause for the trouble that was not found. We feel secure in saying, nevertheless, that in cases of anemia, malnutrition, unthriftiness, etc., when other causes can be eliminated and large numbers of the parasites are found, most likely the parasites were the disturbing factor. This is especially true of colts. In colts that are on good feed but are not doing well, unthrifty, stunted, listless, pot-bellied, anemic, with occasional edema of the sternum, abdomen and legs, strongylosis may be suspected. The pulse may be fast and weak. In some cases the temperature may be as high as 105° F. The disease most likely to be confused with strongylosis is infectious equine anemia, the only positive differential diagnosis being the reproduction of the infectious equine anemia in susceptible animals. Adult horses show about the same symptoms as colts, but the symptoms are not, as a rule, so pronounced, tending to be those of a chronic digestive disturbance.

There is good reason to believe that these worms secrete a toxin that has a direct action on the red corpuscles, causing hemolysis. This, along with the blood-sucking habit of the worms, can easily account for the severe anemia that may accompany strongylosis. In colts we have found as low as three million red cells in a number of cases.

For diagnosis of parasitisms we have found that we can not rely at all on a presence or absence of an eosiniphilia in drawing conclusions. This point will be enlarged upon in a later paper.

In the control of *Strongylus* it is safe to assume every horse infested and act accordingly. There is no treatment for an animal that has an aneurism. The only thing to do is to prevent the colts from getting them by proper sanitary measures. The only treatment we have found effective for *Strongylus* in the intestines is oil of chenopodium followed by raw linseed oil or an aloes ball. After a fast of 24 or preferably 36 hours an adult 1,000-pound horse is given 16 to 20 mils of oil of chenopodium in a capsule, followed at once by 1½ quarts of raw

linseed oil or an aloes ball. The dosage should be varied according to the size and age of the animal. We have found 15 mils of oil of chenopodium and 1½ pints of raw linseed oil to be effective in 2-year-old 700-pound colts.

We have checked up this treatment by carefully examining the feces for worms, then, in about a week, conducting a careful autopsy to see if the treatment has been effective. So far we have found the treatment to be from 85 to 100 per cent effective if the animal is properly fasted. In three animals that were fasted only about 16 hours the treatment was very ineffective, only one worm being gotten from one, two from another, and none from the third. All had large numbers present. The fast was not continued because of the weakened condition of the animals, and it was not thought that they would stand a 36-hour fast.

Oil of chenopodium is somewhat irritating to the membranes, and it should be given either in capsules or mixed with the raw linseed oil. We prefer to give it in capsules, and then, if some of the raw oil is spilled, there is less loss of effect than if some of the oil of chenopodium were lost.

Animals usually begin to pass worms in 16 to 20 hours, and may continue for 84 to 96 hours. Most worms are passed between the fortieth and sixtieth hours. Larger doses (30 mils) of the oil of chenopodium can be given safely, but there is no real need of this, the 16 to 20 mils being very effective.

From observations of one animal, this treatment can be safely administered to pregnant mares. One animal about 8½ months pregnant was given the full treatment of oil of chenopodium and 1½ quarts of raw linseed oil with excellent results. Apparently there were no ill effects on the mare or the colt.

Because of the present high price of raw linseed oil and the messiness and often great difficulty in administering it, some animals were given an aloes ball two hours after the administration of the oil of chenopodium. From observations on several cases, this method of treatment is as efficient as the other, and it certainly is much easier and cheaper to use. This treatment is well worth trying because of its simplicity, raw oil being rather difficult and dangerous to give to certain fractious horses. As the aloes ball is rather a drastic purge, it might be well to follow the usual precautions and not give it to pregnant mares, the oil being preferable in such cases.

CYLICOSTOMUM

Under this genus there have been described from 12 to 20 species. We have not classified them according to species, but only as to genus. This is a time-consuming problem, and our time would not permit classifying according to species. Numerous differences have been observed in the ones found, and probably 8 or 10 different species were observed.

These worms are very small and resemble small pieces of food débris, consequently they may be readily overlooked in the intestines even if in great numbers. They are found in the colon and cecum, but are more numerous in the former. They have been found in 70 per cent of the horses examined. As many as 50 have been counted in a teaspoonful of the colon content taken at random.

They are always found free in the intestinal content or sticking to the wall, but never attached as are the strongyles. Some writers state that they live on the intestinal content and are not blood suckers; others state that they live on both intestinal content and blood. We are inclined to the latter belief, having been able to discern what we considered blood and blood corpuscles in the digestive system of the worm. The spectroscope was not used.

Just what symptoms are caused by the presence of these worms is a matter of conjecture. They are usually present whenever strongyles are, and, with the exception of the aneurisms from *Strongylus vulgaris*, it is difficult or impossible to differentiate between the symptoms when the worms are present in the mixed infestation. Most likely many of the symptoms attributed to strongyles, such as severe marasmus, are really due to cylicostomes. We might say, however, that the animal with the most severe infestation with *Cylicostomum* we have ever seen was exceedingly fat and apparently in the best of health. There were very few strongyles present in this same animal.

A good purgative will remove many of the cylicostomes, but we have had from 80 to 100 per cent success with the same treatment as for strongyles. In light infestations we usually have 100 per cent results, but in severe ones percentages have not been so high. The worms not being attached, they are easier to remove than the strongyles.

The *Strongylus* and *Cylicostomum* in our opinion are the two most important genera of intestinal worms. We find one or the other or both in over 95 per cent of our autopsies.

There is considerable seasonal variation of these worms, many more being found on autopsy during the late fall and winter. This naturally accounts to some extent for the symptoms being more pronounced at these seasons. This is also the time of the year when the greater losses occur.

ŒSOPHAGODONTUS

We have found no specimens of this genus. These worms are almost identical in gross appearance with those of *Cylicostomum*, and may have been present, but, if in small numbers, could be easily overlooked. They have been reported only a few times from North America and are most likely of little importance as yet.

TRIODONTOPHORUS

Triodontophorus spp. have been found in small numbers several times. They resemble *Cylicostomum* very much and probably present nothing of great difference. Our differential observations are not extensive enough to warrant any positive statement. We have not found the ulcers in the large intestines in these infestations as have been reported by some writers. The same treatment as for *Cylicostomum* has been effective.

GYALOCEPHALUS

We have found no specimens of the genus *Gyalocephalus*, although it has been reported from Canada. These worms are very small, being even smaller than those of *Cylicostomum*, but resemble them very much.

As far as is known there is no way of estimating the relative disturbance that these worms, *Strongylus*, *Cylicostomum*, *Œsophagodontus*, *Triodontophorus* and *Gyalocephalus*, may cause. In the extent that these parasites are found to be the cause of severe disturbances, observations on a large number of cases with careful autopsies might lead to something definite. At the present time this has not been done.

OXYURIS

Of the two species of *Oxyuris* only one has been found, namely, *O. curvula*. These worms have been found in small numbers in 10 per cent of the animals examined. We have observed no special symptoms as the result of their presence. The oil of chenopodium treatment as outlined for *Strongylus* has been 100 per cent effective in three cases with small infestations.

SETARIA

Setaria equina has been found in 70 per cent of our autopsies. From 1 to 60 have been found. They have always been found free in the abdominal cavity. The only harm that has been attributed to these worms was found in the animal that had 60 present. In this animal there was a mild chronic fibrinous peritonitis with about 2 liters of a straw-colored serum present. This condition caused the animal no apparent harm and was not suspected until autopsy.

ANOPLOCEPHALA

No tapeworms have been found, although they have been reported to the writer from two sources. These reports have not been checked up, and it is possible that the parasites were not tapeworms. Mention of them is made here to show their scarcity and to remind others to keep a close lookout for them.

TREATMENT

The oil of chenopodium treatment followed by raw linseed oil or an aloes ball has been used in the field on about 2,000 animals with very gratifying results. In only a small percentage were the feces examined, but in some that were examined worms were found in varying numbers. Probably the treatment was as effective as in the experimental cases. The general physical improvement that was noticed indicated that the treatment was well worth the trouble and expense. After observing the result on this large number of animals, it can be said that the treatment is satisfactory in all respects. No bad effects were noted in any of the animals.

ACKNOWLEDGMENTS

The writer is greatly indebted to Dr. B. H. Ransom, Division of Zoology, Bureau of Animal Industry, Washington, D. C., for the identification of most of the parasites mentioned in this paper, and to Dr. George C. Taylor, Union Land and Cattle Company, Reno, Nevada, who administered the treatment to most of the field cases.

NOTE.—A later report from one ranch where about 400 work animals were treated states that the animals did their work at least 50 per cent more easily than ever before, and no grain was fed this year. The most practicable treatment was aloes and oil of chenopodium, especially among the range horses.

LOSSES AMONG SHEEP IN THE ROCKY MOUNTAIN REGION[1]

By GEORGE W. STILES, JR.

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THE MORTALITY from all causes among sheep in the Rocky Mountain region has been estimated at 8 to 10 per cent of the flocks each year. Some of the factors apparently responsible for these losses are insufficient shelter and feed during severe snowstorms, depredations of wild animals, plant poisoning, old age, parasitic infestation, and the toll exacted by infectious diseases.

According to Government statistics[2] approximately 40 per cent of all the sheep raised in the United States are found in eight of the Rocky Mountain States—namely, Idaho, Wyoming, Montana, New Mexico, Utah, Colorado, Nevada and Arizona. From the same Government statistics we are informed that the value of the sheep industry to our country is $511,654,000, of which amount $190,330,000 is represented in the eight States previously mentioned. Considering the estimate of 8 to 10 per cent annual loss to be fairly correct, the sheep raisers and feeders lose from $15,000,000 to $20,000,000 each year from these factors, which may be controlled in part by a better understanding of the underlying causes of these losses. This statement is more particularly true with respect to the item of infectious diseases among sheep, the chief feature to be considered in this paper, which factor is possibly responsible for one-half the loss, or approximately 4 to 5 per cent of the total.

DISEASES AMONG SHEEP

Hemorrhagic Septicemia.—Through the work of Dr. I. E. Newsom and others the occurrence of hemorrhagic septicemia in sheep has been pretty well established in this vicinity; however, it is possible that many instances of heavy loss in sheep have been diagnosed erroneously as being attributed to this disease.

In our own experience we have diagnosed hemorrhagic sep-

[1] Presented at the Eighteenth Annual Meeting of the Colorado Veterinary Association, Denver, January 20, 1921.

[2] Sheep and Wool Products, Number and Value on Farms, January 1, 1920. Yearbook, U. S. Department of Agriculture, 1919.

ticemia in sheep after a careful field and laboratory investigation. Vaccination with ovine hemorrhagic septicemia bacterins promptly relieved the situation. In other instances when the diagnosis was doubtful, or even considered positive hemorrhagic septicemia from postmortem examinations, vaccination by administering bacterins, even by using a second and third dose in increasing quantities, has proved unsatisfactory; consequently in such instances the conclusion must be drawn that the diagnosis was incorrect, the bacterin at fault, or the dosage used was insufficient to produce immunity. In view of recent investigations it would appear that in some instances at least diagnosis was the chief factor to be considered.

Parasitic Infestation.—Considerable loss among sheep is doubtless directly or indirectly due to the presence of external and internal parasites, and thorough eradication and control is justified.

Ictero-Hematuria.—This disease in sheep, where intense jaundice is the predominant lesion noted in dead animals, appears to be more common in this mountainous region than is mentioned in literature. A number of outbreaks have come under our observation during the autumn months of the year.

Plant Poisoning.—The ingestion of poisonous plants is the probable cause of death in many sheep where the feed is scarce during the growing season of the plant or under other circumstances; however, it is possible that some diagnoses attributed to this cause may in reality be due to the presence of pathogenic bacteria; consequently, the bacteriologist and the plant pathologist should check each other's investigations whenever possible.

LOSSES IN THE SAN LUIS VALLEY, COLORADO

The San Luis Valley, some 150 miles long and 100 miles wide, located in the southern part of the State, at an elevation of about 7,500 feet, and surrounded by mountains, is noted for the winter feeding of lambs. It is reported that some 17 years ago Mr. L. B. Sylvester, of Monte Vista, introduced pea feeding into this Valley. He fed a small band of sheep on peas, and when sold at the market they commanded a fancy premium above the regular price. Since that time the importance of the industry grew until in 1908-9 a maximum of about 500,000 lambs were being fed there largely on peas.

The process of sheep feeding restored the fertility of the soil and permitted rotation with potatoes and other crops, consequently the Valley was very prosperous during those years. However, there came a time when the so-called normal loss of about 2 per cent in feeding lambs in that vicinity began to increase. Each year a larger number of feeders would experience losses approximately 10 per cent or more, with individual cases of 18 per cent loss, bringing the average loss, as determined by Dr. L. L. Glynn,[1] up to about 6.5 per cent for the year 1919.

This single factor of heavy loss has reduced the feeding of lambs in the Valley to about one-tenth of the number fed during prosperous years, or around 50,000 head during the season 1920-21. In view of the economic value of these sheep and the relative welfare and prosperity of the residents of the Valley, the problem of preventing this loss and permitting the maximum feeding of lambs has been the subject of much consideration by both State and Federal officials.[2]

SUGGESTED CAUSES OF THE LOSSES

Feeding.—The chief factor of these losses has been centered around the question of an unbalanced ration, a too heavy protein diet being considered a potent factor in connection with feeding. It is customary for the weaned lambs to be brought from the range during the month of October and placed on feed. After the lapse of about ten days or two weeks the lambs began dying, and they continued to do so during practically the entire feeding period of three months, which time is required to fatten them for market.

Methods of Feeding.—Lambs are usually started very slowly on peas, perhaps only 10 to 30 minutes twice daily at first, gradually increasing this period to full feed. Some feeders use the sheep to clean up their potato ground of vines and small potatoes during the early feeding season. Still others feed oat straw and alfalfa hay at night and turn the lambs into the pea fields during the day, with or without a herder. Oftentimes the lambs have free access to uncut meadow grass, a straw stack or stubble along with their ration of peas. In a

[1] Drs. L. L. Glynn and A. G. Wadleigh, of Monte Vista, Colo., furnished valuable data relative to the historical aspect of lamb feeding in the Valley.

[2] Drs. G. H. Glover, I. E. Newsom and E. W. Alkire, of the State Agricultural College, have studied this problem for some time, carrying on valuable feeding experiments and making extensive field investigations. Their findings are published in the JOURNAL OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION for April and May, 1919.

few instances our investigations show that alfalfa hay was the only roughness received, yet the losses in these lots were of a similar character, though varying in degree, as in those fed on peas.

The peas grown are known locally as "Field," "Black-Eye," "Marrowfat" and "White English." These same varieties have been fed for the past 10 to 12 years. They are usually left to ripen in the field and fed in that condition by allowing the sheep to graze in the fields, or some farmers mow and stack them before full maturity.

Moldy feed has been considered a factor in causing death losses, but little evidence is produced to support this theory.

Regardless of the manner of feeding and the methods practiced, most feeders experience losses apparently of a similar nature. It is thought by some that the generous feeding of a straw and meadow hay along with peas made the losses less severe. However, the situation has been a discouraging one at best, and no single plan of feeding has proved successful.

Other Suggested Causes.—The disease of hemorrhagic septicemia was once considered a more potent factor among the losses in pea-fed lots, but vaccination experiments against this disease have proved unsatisfactory in many instances. Plant poisoning has been suggested by some, but losses occur where no poisonous plants could be found, as determined by Dr. C. D. Marsh.[1]

Tapeworm infestation of the liver likewise is held an active factor, but many autopsies fail to show even the presence of these parasites. Coccidiosis was once considered a possible factor in connection with these losses, but microscopic examination of feces and intestinal contents have failed to demonstrate the presence of coccidia.

Poisoning from a toxin contained within the pea or pea-vines has been considered, and specimens submitted to Washington for chemical examination have failed to show the presence of a poisonous principle. Regardless of all the theories advanced, the sheep continued to die without apparent relief.

BACTERIOLOGICAL AND FIELD INVESTIGATIONS

Since the establishment of a bacteriological laboratory under the Bureau of Animal Industry in Denver, approximately three

[1] Drs. Marsh and Howe made an extended investigation of the plants found in the Valley, and no poisonous plants were discovered by them.

years ago, specimens from about 350 head of sheep have been examined, representing a considerable portion of the Rocky Mountain region. Routine laboratory procedure involved the inoculation of rabbits and guinea-pigs and preparations of cultures from the various tissues received.

In making a recent critical review of our work we find the majority of these primary cultures were made on slant agar and in bouillon (aerobic cultures), with animal inoculation from one or more of the cultures thus obtained, or direct from emulsions of animal tissues. In a few instances anaerobic cultures in shake dextrose-agar were made in addition to the usual aerobic type.

Prior to the fall of 1920 seven instances occurred where strictly anaerobic organisms were determined to be present in sheep specimens from widely different sections of the country. These bacteria were pathogenic to rabbits, pigeons and guinea-pigs, but the opportunity to study these kinds of organisms further did not present itself until recently. It now appears that all the specimens that were received formerly from the San Luis Valley were not checked by anaerobic methods, and many negative animal inoculations with micrococci, colon bacilli and other aerobes failed to assist in establishing a diagnosis. Further consideration of this subject will be given subsequently.

On November 13, 1920, I made my first trip to the San Luis Valley during the period when lambs were being fed and the heavy losses occurred. Prior to this time other investigations had been made in the spring during the lambing season in the Valley. A second trip was made December 21, each time three or four days being spent in the field making autopsies, collecting data and studying the problem from every angle possible. During these trips in November and December made by myself and two similar trips by Dr. W. E. Howe [1] during the same months we have posted and examined specimens from 40 head of sheep representing 17 different bands.

Symptoms

The fattest and most thrifty lambs seem to be affected more frequently than the others. Diarrhea is a prominent symptom, with reddened, bleeding rectal mucous membranes. Early in

[1] Inspector in charge of the Denver office. Dr. Howe has made a number of field investigations and offered much assistance in conducting this work.

the disease the tail, legs and wool become soiled with liquid feces, often streaked with bloody mucus. Temperature observations may show fever or normal or subnormal readings. Bloating may occur. Lambs considered healthy the night before may be found dead the following morning. Should they live for a day or two, such lambs may show extreme weakness, labored breathing, walk with a staggering or stiffened gait, drool at the mouth, grind their teeth, and finally become prostrated and die. Feeding lambs are more commonly infected than older animals, although the disease has been observed in mature sheep.

Postmortem Observations

A consideration of the recent autopsies held on 17 cases from the San Luis Valley by myself correspond in the main with those observed by Dr. Howe and others on dead lambs from the Valley and in other parts of the State. They show a marked variation in the degree and extent of the lesions observed. This is particularly true with the changes seen in those slaughtered for autopsy when compared with those dying naturally.

Three slaughtered sick sheep in the San Luis Valley exhibiting marked symptoms of the disease showed very little abnormal conditions of the viscera. It is probable that such carcasses would have been considered suitable for food. In two such cases the writer found only a slight enlargement of the mesenteric lymphatics, faint reddening of the mucous membranes of the fourth stomach, and mild enteritis of the small intestines. In lambs dead of the disease the subcutaneous tissues were sometimes congested over the shoulder, neck, back and rump regions. In some instances petechial hemorrhages were evident in the form of blotches on the body, and muscle tissues of the neck, leg or shoulder would show darkened areas, often containing bubbles of gas.

The lungs were usually slightly congested. Reddening of the trachea was often observed, with a frothy mucus. In some instances the heart showed well-marked petechial hemorrhages, while in other cases only a reddened blotch was noted. Considerable fluid, either clear or bloody, was frequently found in the thoracic, pericardial sac, or peritoneal cavity. In the abdominal cavity the liver appeared pale and friable and the gall bladder usually distended. Occasionally a fringed tapeworm was seen in the bile ducts. The kidneys are generally softened and de-

generated. In some liver specimens gas bubbles may be seen in the tissue. Usually the spleen is normal in size, but it may be softened in texture. Considering the digestive tract, the fourth or true stomach occasionally shows some degree of reddening, congestion or inflammation; the shade of color and intensity of the change seems to vary within considerable range. In a few cases the third stomach showed similar reddening, also the inner coat of the first and second stomachs was noted to peel off very readily as though partially cooked; this probably occurs only in cases dead for some time. The first stomachs usually contained large quantities of food, often showing considerable gaseous distention. Generally the abomasum or fourth stomach contained little feed, but frequently a darkened watery, bile-stained fluid. The inflammation observed in the fourth stomach usually extended into the duodenum and into the small intestines, showing punctate hemorrhages and areas of congestion, thereby accounting for the diarrhea present. Sometimes the small intestines were diseased when the fourth stomach appeared normal. Almost invariably the rectal mucous membrane appeared thickened, thrown into folds and deeply inflamed.

Occasionally a sero-gelatinous exudate was observed in the abdominal cavity or elsewhere in the body. The thymus glands may show petechiation and the lymphatics are often enlarged and congested in young lambs. Many of these autopsies were made shortly after death of the animal, with freezing temperatures. Quick decomposition of the carcass was noted in many cases even during severe cold weather, but no odor of putrefaction is noted in freshly dead animals.

Laboratory Studies

In view of previous experience with anaerobic cultures made from sheep dead of unknown causes, it was decided to make systematically an additional series of cultures anaerobically from each tissue examined, for comparison with the results obtained in the usual aerobic manner. This plan of procedure was adopted on the series of specimens collected from the San Luis Valley in November, 1920, and with the excellent results obtained our technique has since been revised to include anaerobic cultures from every animal specimen examined bacteriologically.

Briefly, the technique is as follows: Each tissue is seared

with a hot spatula; and by the use of sterilized instruments small sections of the specimen underneath the heated portion are removed and placed in Smith fermentation tubes containing dextrose broth or other suitable liquid media. Care is observed to introduce the fragment of the tissue into the closed arm of the tube. The use of the Smith tubes appears more satisfactory for primary cultures than shake dextrose-agar cultures. In order to compare the aerobic types of bacterial flora encountered with the anaerobic species, cultures on slant agar and into liquid media are made from each tissue in the usual manner.

Quite frequently aerobic cultures heretofore made from the various viscera have failed to develop any growth after several days' incubation. Such tissues were considered sterile. With the use of anaerobic cultures from the same class of specimens we now frequently find different types of organisms, doubtless overlooked heretofore because anaerobic cultures had not been made.

In our recent investigations the majority of the 40 sets of sheep specimens examined have grown largely anaerobic organisms. Sometimes streptococci and *Bacillus coli* type develop with the anaerobes. The aerobic cultures for the most part remain sterile.

Bacteriological Results

The brief period devoted to the study of anaerobic organisms recently obtained from 40 dead sheep from Colorado feeding lots does not warrant the definite classification of the various types encountered

A thorough study of the article prepared by Heller [1] convinces one that it is necessary first to separate properly in pure culture each strain of anaerobic organisms isolated and test its biological and pathogenic properties before arriving at any definite conclusion. However, sufficient work has been done to state that strictly anaerobic pathogenic organisms have been isolated from sick slaughtered sheep, likewise from those dead of disease in the same flocks. But further work is necessary to place them definitely in their proper classification.

The predominating anaerobic type of organism which we

[1] Etiology of Acute Gangrenous Infections of Animals. A discussion of blackleg, braxy, malignant edema and whale septicemia. Studies on pathogenic anaerobes, by Hilda Hempl Heller. Journal of Infectious Diseases, vol. 27, no. 5, Nov., 1920, pp. 385-451.

have isolated from the various sheep specimens shows the following biological characters:

Morphology.—A rod-shaped bacterium about 1 micron in width and varying from 2 to 8 microns or more in length. Occasionally long filaments may develop in alfalfa, straw, mannite broth or in animal tissues. The ends of the rods are usually rather square cut, and they may occur singly, in pairs, or in short chains, and often arranged like the letters W or V.

Spores.—It is believed that spores develop in this organism, but their demonstration for a certainty has thus far been attended with difficulty. Terminal spores have been observed in some of our cultures; for instance, 1 per cent egg albumen; but checking such cultures has shown the presence of other bacterial strains—they were not observed in sugar media inoculated with cultures developing from single colonies. The resistance of the organism against heat would indicate the existence of spores.

In testing these characters the organism has been subjected to a temperature of 85° C. for periods varying from 15 minutes to 2 hours, and growth usually occurred after the longest time of exposure. From these subcultures developing subsequent to heating a series of shake agar tubes are used to grow well-separated colonies for further purification.

One strain under observation has been planted four different generations from single colonies in shake agar, and yet the greatest care was necessary to keep the strain free from spore-bearing species; possibly they belonged to the organism under observation. Further study and observation is necessary to determine fully this and some other doubtful characteristics.

Motility.—Motility has not been observed in cultures known to have been developed from a single deep, well-separated colony growing in shake dextrose-agar tubes. In animal fluids and cultures presumed to be pure an occasional sluggish motile rod has been noted.

Capsules.—Stained organisms from animal tissues, or when grown in substances rich in nitrogen, such as egg albumen, generally show capsules. Capsules are absent in cultures grown in sugar media.

Staining.—The organism stains quite readily with most laboratory stains. It appears to retain Gram's stain unless overtreated with alcohol.

Growth in Culture Media.—The organism is strictly anaerobic.

Gas Production.—Gas is rapidly produced in all media containing ordinary sugar. Within 3 to 4 hours after inoculation with 0.5 c.c. of a liquid culture, Smith dextrose fermentation tubes at 37° C. will show beginning active gas development, and after 24 hours the liquid in the entire length of the closed arm of the Smith tube will be displaced by gas which explodes readily when ignited.

Large quantities of gas (95 to 100 per cent) are produced in dextrose, lactose and saccharose. Smaller quantities (from 5 to 20 per cent) are produced in pure 1 per cent egg albumen, gelatin, mannite, pea-vine,[1] alfalfa and meat broth, also in milk. No gas developed in broth cultures made from wheat straw or meadow hay and in 5 per cent glycerin.

Milk.—In Smith tubes alkaline litmus milk is rendered slightly acid. About 10 per cent gas develops in the closed arm, but coagulation does not occur after several days' observation either in the incubator or at room temperature.

Gelatin.—Cultures in Smith tubes placed at ice-box temperature show no signs of development after 2 weeks' observation. These same cultures develop freely when placed in the incubator. The gelatin remains liquid after growing in the incubator a few days and then being placed in the ice-box over night.

Animal Inoculation

A total of 41 guinea pigs, 6 sheep, 3 rabbits and 2 pigeons have been under test. Most of these animals received anaerobic cultures or tissue emulsions, usually by subcutaneous inoculation. Nineteen guinea-pigs were not affected, while 22 died within about 24 hours after inoculation; 4 sheep, 2 of the rabbits and both pigeons also died. Of the guinea-pigs which were not affected, 4 received lung emulsions, 3 kidney, 3 spleen, 3 muscle tissue, 2 blood, and 4 pure cultures. Anaerobic dextrose broth cultures from some of these same tissues, however, killed 6 guinea-pigs with lesions resembling others of the series dead of sheep inoculations.

Of the 22 guinea-pigs dying from cultures or tissue inocula-

[1] Broth was made from peas and pea-vines, alfalfa straw and meadow hay without the addition of any sugars. All fermentation tests were made in Smith tubes. Cultures were autoclaved on 2 successive days.

tions, 6 received dextrose broth cultures, 3 each liver, lymphatic or thymus gland emulsions, and 3 a pure culture strain. The doses received by these inoculated guinea-pigs, both dead and surviving, varied from 0.1 to 1 c.c. of a 24-hour dextrose anaerobic culture and from 0.5 to 1 c.c. of the tissue emulsions. Death usually occurred within the first 24 hours, showing extensive edema with bloody infiltration at the point of inoculation, extending well over the abdomen subcutaneously. A little gas was usually observed in the connective tissues. Internally, dead pigs usually showed some fluid in the peritioneal cavity (subcutaneous inoculation) with occasional gaseous distention of the intestines. Anaerobic cultures were obtained from the spleen, kidney or liver in most cases, aerobic organisms sometimes being present only in the lung cultures.

Postmortem Notes on Guinea-Pig No. 450.—Weight about 12 ounces; strong and healthy. January 18, 1921, at 10 a. m., this pig received 1 c.c. of a 72-hour hog's liver broth culture, subcutaneously in the right hind leg. This culture was obtained from the kidney of lamb No. 1344, posted shortly after death in the San Luis Valley during zero weather. The lesions were typical of others posted in that vicinity. Tissues for bacteriological examination were placed in sterile glass jars, packed in dry borax and practically frozen until brought to the laboratory on the following day. All the cultures from this lamb developed only anaerobic organisms.

The strain of culture used to inoculate guinea-pig No. 450 was first incubated at 37° C. for several days, then heated to 85° C. for 15 minutes. Shake plain agar cultures were prepared from the subcultures after heating, and single colonies were fished from the deep agar growths. Consequently this strain was apparently a pure culture taken from a sheep recently dead of the disease, heated to destroy possible saprophytic species, further purified by colony isolation, and when grown into dextrose fermentation tubes produced the following lesions in a guinea-pig after 29 hours' inoculation: Temperature at the time of inoculation, 99.4° F.; three hours later, 102° F.; five hours later, 104° F. Leg swollen. Next day, 11 a. m., guinea-pig very sick; temperature 94.6° F. Pig chloroformed.

Autopsy immediately after killing by chloroform to eliminate possible intestinal or other outside invading organisms. Subcutaneously, at the point of inoculation and over the entire

abdominal portion of the posterior half of the animal the skin is slightly raised from the body. A bloody, serogelatinous exudate, estimated at 10 c.c. in quantity, with a puff of gas, discharged from the pocket thus formed. Microscopically this gelatinous fluid contained blood cells, leucocytes, tissue cells, and numerous nonmotile rod-shaped organisms. A similar smaller area with only a few gas bubbles was observed subcutaneously in the region of the left shoulder. In some respects this infiltrated region resembles the lesions seen in guinea-pigs inoculated with anthrax organisms. Internally the lungs appeared normal. The bile bladder was distended with bile, the small intestines containing considerable clear fluid and gas. No fluid was observed in the peritoneal or thoracic cavities. Stained smears from the liver surface show very few rods, similar in character to those found at the point of inoculation. No long filaments were observed on this specimen of liver tissue. These results differ from previous observations made on guinea-pigs inoculated with cultures or material that were probably impure.

After incubating at 37° C. over night in sterile Petri dishes, no spore-bearing organisms were observed in the muscle or liver tissue. Cultures from the lung, liver, spleen, kidney and serous fluid developed pure anaerobic strains of organisms.

One of the 6 lambs received 3 c.c. subcutaneously of muscle emulsion from one of the rabbits that died in less than 24 hours after inoculation. This sheep was inoculated at noon on one day and died at 7 a. m. the following morning. Temperature observations showed an initial rise to 105.8° F., subsequently dropping to 99° F. one hour before death. The lesions in the sheep corresponded generally to those outlined under postmortem findings, however, showing more bloody infiltration at the point of inoculation and glandular enlargement with well-marked petechial hemorrhages on the heart, closely resembling lesions described as hermorrhagic septicemia. Anaerobic gas-producing organisms were obtained from this dead sheep.

Lamb No. 2 received 10 c.c. by mouth of the same rabbit muscle emulsion used on lamb No. 1, simultaneously with the inoculation of lamb No. 1. Three days later the feces became softened and blood-streaked for one day only. The temperature remained normal up to this time. After 8 days from the first dose two doses of 5 c.c. each from the same strain used on

sheep No. 1 were given on bran at the morning and night feeding. The temperature rose from 102 to 106° F. During the evening of the ninth day the lamb refused feed or water, and the following forenoon it died. The morning temperature before death was 103.4; the animal was prostrate and drooling at the mouth, with labored breathing, dropped ears and grinding teeth.

Postmortem showed the following: Upon removing the pelt no visible lesions were noted subcutaneously except a few hemorrhages on the feet, appearing as though slightly bruised. (These lesions on the feet have since been observed by Dr. Howe in cases dying in the field.) The lungs were slightly congested with considerable clear fluid in the pericardial sac. The heart showed slight external hemorrhages but no evidence of petechia. The liver was apparently normal, possibly somewhat enlarged, and light colored. The pulp of the spleen and kidneys appeared softened. The mucous membrane of the abdomasum or fourth stomach showed inflamed areas, not marked, but distinctly noticeable. No lesions were evident in the first, second and third stomachs. Inflamed, mucous, bile-stained areas appeared in the entire length of the mucous surface of the small intestine, some portions being more intense than others. The large intestine seemed normal, while the mucous surface of the rectum showed patches of inflammation. About 1 pint of bloody fluid was present in the abdominal cavity. The lymphatics were slightly enlarged and watery.

Lamb No. 3 received 3 c.c. of the bloody fluid from the point of inoculation of guinea-pig No. 450, subcutaneously in the axillary space, at 10.15 p. m., January 19, 1921. Temperature 102° F. At 7 a. m. the following morning the lamb showed a temperature of 106.4. The leg was somewhat swollen; feed and water were refused. The lamb was scouring freely and breathed heavily and irregularly, grinding the teeth as though in pain. At 11.20 the temperature was 107.2° F. The lamb was killed by bleeding for autopsy purposes. The chief lesion was at the point of inoculation. A considerable quantity of clear, slightly blood-tinged, sero-gelatinous fluid was present in the subcutaneous and deeper tissues. The lungs were slightly congested; other viscera appeared quite normal, except the enlarged gall-bladder, which showed considerable gas in the bile.

Anaerobic cultures from the spleen, kidney and liver of lamb

No. 3 showed the presence of gas-producing organisms similar in character to the group under observation.

Two lambs are now under experimentation in connection with possible immunization against the disease.

The rabbits and pigeons inoculated died within 24 hours after injection, showing bloody tissues at the point of inoculation, with recovery of anaerobic organisms.

POSSIBLE SOURCE OF INFECTION IN FEEDING LAMBS

Doubtless domestic animals are carriers of infectious diseases in the same manner as typhoid fever, diphtheria and other well-known cases in human medicine. Through the medium of possible carriers infecting the soil and drinking water from year to year, combined with heavy irrigation as practiced in the Valley and other arid regions, it is quite conceivable that anaerobic organisms would survive the ordinary methods of tillage, especially when protected by cover crops during the summer, to be ingested with feed by lambs when turned into pea fields, "spud" grounds, and on other fields where the organism had been sown.

If anaerobic organisms are responsible for the major portion of the trouble in feeding lambs, then the manner of distribution and behavior is a problem for extended study. These organisms are shown to be passed by the feces of sick sheep through the inoculation of a small quantity of the feces into a guinea-pig with the recovery of the bacterium from the dead pig.

In the San Luis Valley certain fields or portions of fields are known as infected areas. Low depressions where water has stood from heavy subirrigation appear to be more favorable for the development of the disease than are the fields better drained. Historical data also show that losses have occurred on certain farms for several years past, while virgin fields cultivated or pastured by sheep for the first time are comparatively free from losses.

Postmortem examination of dead lambs often shows the presence of considerable sand in the intestinal tract, showing the possibility of ingesting germ-laden soil while eating peas fallen to the ground or feed contaminated with such material.

The conditions observed in the first stomach of dead pea-fed sheep appear ideal for the multiplication of anaerobic organisms, particularly in the presence of aerobic germs and the rich, nitrogenous food made possible by the presence of large quantities of peas, alfalfa and similar material.

EXPERIMENTAL IMMUNIZATION

Owing to the difficulty in separating pathogenic strains of anaerobic organisms obtained from sheep dead of disease and the shortness of time, but little work has yet been done; however, the encouraging results already obtained warrant further investigation and experimentation along this line, and it is hoped that some product can be elaborated to combat the losses in sheep before the heavy losses occur next autumn.

BRIEF DISCUSSION OF RESULTS

The results thus far obtained from this investigation suggest the possibility of anaerobic organisms being an important factor in losses of sheep in the Rocky Mountain region.

Much additional laboratory and field work are necessary to demonstrate the part played by anaerobic organisms in sheep, also their prevalence in nature, and if they are also pathogenic for other domestic animals.

It is our purpose to examine bacteriologically many specimens from sick sheep slaughtered for autopsy purposes. In this manner the possibility of isolating saprophytic organisms from the tissues will be reduced to a minimum and the opportunity to obtain pure cultures will be enhanced.

CONCLUSIONS

1. Losses among sheep in the Rocky Mountain region have been estimated at 8 to 10 per cent per annum from all causes, including losses due to wild animals, severe winters, old age, lack of food, poisonous plants, parasitic infestation, and the ravages of pathogenic bacteria.

2. The sheep industry is economically closely related to the welfare of mankind, and the heavy losses sustained become not only a personal consideration but a problem of importance to the country at large. An estimated loss of from $15,000,000 to $20,000,000 annually is believed by some investigators to be the toll exacted from year to year in this western country.

3. Bacterial diseases probably account for a considerable percentage, perhaps 4 to 5 per cent, of the loss among sheep, and it is hoped that by proper diagnosis and application of remedial and preventive measures these losses may be materially reduced. The reduction of only 1 per cent in the loss means a possible saving of from $1,500,000 to $2,000,000 annually.

4. Recent investigations have shown the presence of anaerobic pathogenic organisms obtained from sick slaughtered sheep as well as from those freshly dead of the disease, which quickly kill laboratory animals in small doses; also a sheep fed with 20 c.c. of these organisms died after 10 days' incubation, showing symptoms and lesions similar to those observed in natural cases dying from the disease.

5. In view of the laboratory findings herein recorded, it is hoped that prophylactic measures can be developed to prevent heavy losses which occur every fall and winter during the feeding season of lambs in feed lots of the Rocky Mountain region.

A writer in *Breeder's Gazette* says: "In view of hard experience, I should never think of buying a purebred animal except from a Government accredited herd. Until this work was done by the United States Department of Agriculture I know from many test chart records that tuberculosis was much more prevalent in purebred dairy herds than in ordinary scrub cattle."

The Argentine government is preparing a decree prohibiting the importation of cattle or forage from Brazil, as a result of the appearance of rinderpest among the cattle herds in the southern states of Brazil. The Argentine government's action follows a similar prohibition imposed by the government of Uruguay.

"Do We Need Horses in California?" by Hamilton Bassett, is the title of the leading article in *Rural World* for April 1. This says in part: "In the last two years there has been shipped out of California, ended with the fiscal year June 30, 1919, a total of horses and mules worth almost $27,500,000, and the average value was about $175. It is a most significant fact that at the present time the Japanese are maintaining a stud for the breeding of cavalry mounts just east of Santa Rosa."

"Brands and Branding in the West," is the title of an extensive article by W. F. Wilcox, honorary member of the A. V. M. A., in *The Breeder's Gazette* for April 7, which gives the history and practice of burning identifying characters upon cattle and horses in the ranch and range country, and a digest of State laws bearing upon the subject.

COMBINATION TUBERCULIN TESTS[1]

By D. K. EASTMAN, *Bangor, Maine*

THE WORLD has advanced greatly in the past few years. Not only have there been many valuable inventions and much progress made along industrial lines, but this is true also of science, and it is gratifying to know that veterinary science has advanced and kept pace with the great inventions that have proven so successful. There have been discovered serums and vaccines that have proven invaluable to the veterinarian in eliminating the fatal diseases which exist in livestock.

Tuberculosis eradication today is one of the great problems that confronts all of us, and it is work that will go down in history as one of the greatest undertakings that the veterinarians have ever accomplished. We should be proud that science has given us other methods of diagnosing tuberculosis besides the subcutaneous test. While this has proven successful in the past and was our best known method of detecting tuberculosis in cattle, we have today check tests that are so valuable, as experience has proven to me, that I would not be satisfied with any one test in a herd that had previously been tested or where disease had prevailed for a number of years. I think all three tests should be applied, and when this has been carefully done I feel confident that we can go away from that herd and feel that our decision is 100 per cent perfect.

The intradermal and ophthalmic tests I believe should be applied with the greatest skill and care, for the least mistake will mislead one's judgment. It is very easy in applying the ophthalmic disks in a herd of 40 animals to lose one out, and unless check tests are applied one would be apt to leave a tuberculous animal in the herd to spread the disease to healthy cattle; but when the intradermal test is applied at the same time as the ophthalmic, the danger is lessened to such a degree that it is almost impossible for a diseased animal to get by.

The ophthalmic sensitizing disk should be applied when the herd is first inspected. Care should be taken to have the finger nails short and the hands clean. A light touch should be used. The disk should be put in the upper right-hand corner of the

[1] Presented at the meeting of the Maine Veterinary Medical Association, Augusta, Maine, January 12, 1921.

eye and the hand held carefully over it from three to five minutes at least, as some disks are hard to dissolve. The second disk can be applied from the fifteenth to the seventy-second hour, and observations should begin from the second to the sixth hour. I have known the purulent exudate to last up to the fifteenth and eighteenth hours, but the best observations will be obtained at the sixth hour.

The intradermal injection can be applied right after the first tablet is put into the eye, then the second tablet can be applied after the forty-eighth or seventy-second hour observation has been made. I find one will get best reactions at the seventy-second hour. Sometimes at the forty-eighth hour a known reactor will show a slight swelling, but it will always persist at the seventy-second hour, and lots of times later, but not so pronounced at the one hundred and fiftieth hour as at the seventy-second.

Great care should be used when making the intradermal inspection. Have one standard place of injection. Have the animal well restrained, as one injection is sufficient. Always take notice that there is not a false swelling at the point of injection which might mislead one when taking observations. Sometimes I find that the tail has been twisted and a marked infiltration left, or perhaps a wound from a pitchfork, which sometimes leaves a small swelling, or the animal has suddenly been backed up against a post and a swelling left that might hamper the decision. But with a true reactor there will be a swelling with almost always an infiltration. The size will vary from a small pea to a quarter in diameter.

PHTHISIS IN MALAY STATES

The cases of phthisis in the Federated Malay States have been increasing in number very considerably. In Singapore, for instance, the crude death rate was 4,840 per million in 1916. More cases occur among males (6.04) than among females (3.81). Bovine tuberculosis does not exist there; among more than 250,000 pigs killed in the Ipoh abattoirs during the past four years no case of tuberculosis was found. The disease is, therefore, all of the human type.—*Journal of the American Medical Association.*

THE INTRADERMIC TUBERCULIN TEST

By O. AUGSPURGER

Veterinary Inspector, United States Bureau of Animal Industry, Chicago, Illinois

SINCE the intradermic method of testing cattle, in connection with the tuberculosis-eradication campaign, has been adopted by the United States Bureau of Animal Industry and has been recognized by some of the States for interstate movement, much has been said pro and con regarding its value. The principal points in these discussions are usually centered on the reliability of the test as compared with the other methods, the subcutaneous and ophthalmic, and sufficient emphasis has not been given such questions as the uniformity of application, means of interpretation, checking, etc.

In the busy industrial world of today, when two firms engaged in the manufacture of similar articles show at the end of the year wide variation in the net profits or dividends, they immediately set about seeking the cause, paying attention to details, checking, and introducing a system whereby the causative agent or factor can be detected and remedied.

In conducting the subcutaneous test the Bureau has formulated or outlined a system or modus operandi to be followed not only by those engaged directly in cooperative tuberculosis-eradication work but also by those veterinarians who are on the approved list of veterinarians authorized to conduct the test and issue health certificates for interstate shipments. As a rule these recommendations or requirements are strictly adhered to, and results are and have been satisfactory to the owners and breeders of valuable purebred cattle who are interested in maintaining tuberculosis-free herds.

Similar instructions relative to the application of the intradermic method of testing have been published at various times. However, these regulations, through a possible lack of experience on the part of practitioners and others who have not used the intradermic method to any considerable extent, have led to different interpretations; consequently the varying results which are occasionally reported are the natural consequence of the wide differences in the application of the test as regards sanitation instruments, and character and amount of tuberculin injected

It is with the single desire to eliminate these differences of opinion that I herewith present my experiences, views and suggestions, with illustrations, especially to those fellow veterinarians engaged in private practice who at infrequent intervals are called upon to conduct an intradermic test and who perhaps lack the skill that comes in following its use day after day. From the inception of the tuberculosis-eradication work the Bureau was cognizant of its inability to furnish a corps of men adequate to handle the work, and entertained the idea of ultimately transferring this work to the private veterinarians after herds are once accredited. Hence if these few suggestions and illustrations will prove of any value to the prospective custodians of accredited herds, my aims and hopes will have been realized.

THE SYRINGE

As a workman's reputation is in keeping with the condition and care of his tools, so it is with the veterinarian and his instruments; therefore it behooves him to maintain them in a sanitary condition and in perfect working order. Failure to do this has caused many a veterinarian endless worry and embarrassment.

A syringe of 2 c.c. capacity, with long, slender glass barrel and a leather or rubber plunger, such as is shown in Fig. 1, or a 25-minim syringe with a gauge to regulate the dose, is recommended, for two obvious reasons. In the first place, the syringe is small enough in circumference to permit of its entrance into the neck of the ordinary bottle containing the tuberculin, and in this way the tuberculin can be readily aspirated and the syringe refilled with little or no danger of contamination. In the second place, by using a syringe of this description one has more surface to grasp and bring it to the proper angle to insert the needle, and after so doing, to hold it in place, even though

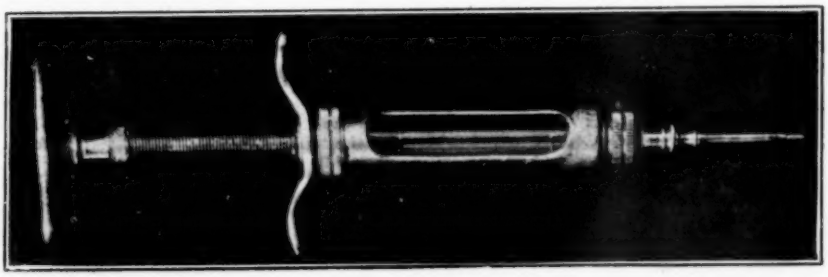

Fig. 1.—Syringe for intradermic tuberculin test

the animal maneuvers about or "shimmies," as the herdsman says, a point every veterinarian should observe in order to produce a minimum of trauma.

Repeated insertions at the same place should be frowned upon, and should you unfortunately meet with an unusually obstreperous animal and the needle be dislocated, a new site either higher or lower or on the opposite side should be chosen. However, this will seldom occur if you insist upon the attendant holding the animal securely. A "bull lead" or "snap" is highly recommended for this purpose and should be used when at all possible.

This question of properly restraining the animal can not be too strongly emphasized, as a perfect injection is assured only under such conditions. Many needles will be saved and possibly faulty interpretations of the test will be avoided.

THE NEEDLES

Different lengths of needles have been recommended and used, ranging from one-fourth inch to five-eighths inch in length, and of various diameters. It is recognized that much good work has been done with these various types of needle. However, it is believed that the best results are obtained when not less than a 25-gauge needle is used.

SEAT OF INJECTION

The usual seat of injection heretofore has been high up into the fold, either right or left, to suit the convenience of the operator. Recently it has been ascertained, however, that injection at a lower point is preferable for various reasons. At the higher point the whole dermal structure lacks the density that is found at a lower place; also the presence of the vast amount of subdermal or aureolar tissue that is ever present at the higher part of the fold is absent in the lower part; consequently when a reaction occurs low it is more distinctly circumscribed and therefore more readily detected. Also, should the swelling surrounding the point of injection be not well defined, the "back-telling," thickening or "cording" of the proximal fold can be more easily noticed than when the injection is made higher up.

THE INJECTION

Permit the tail, slightly below the point where the caudal fold passes gradually into the nude, smooth under-surface, to rest in the palm of the left hand, with the thumb resting against the left side of the tail, the hand at about an angle of 45 degrees, not transversely as is shown in Fig. 2, allowing the point of the index finger to press lightly against the under-surface

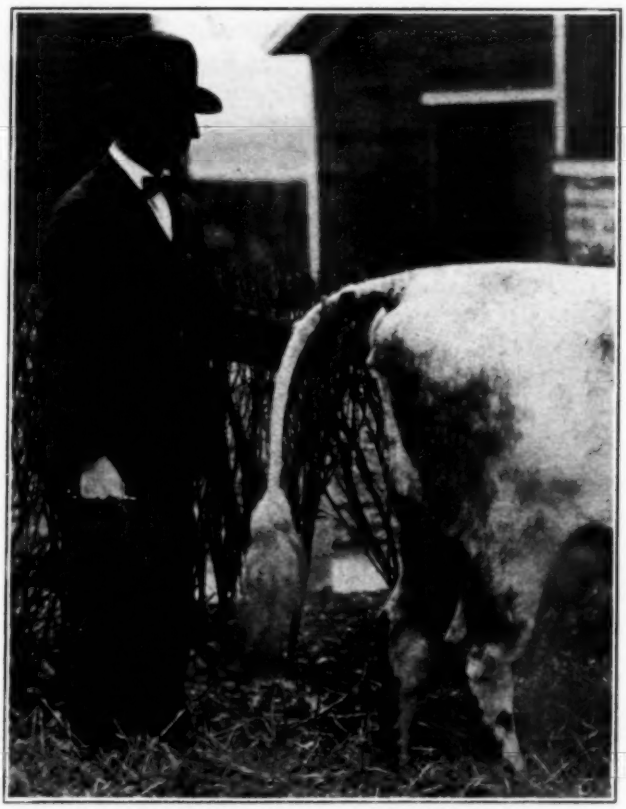

Fig. 2.—Preparing to make injection in tail

slightly to the right. Press this tissue to be injected out to the right, which brings it into view, at the same time holding the second and third fingers in readiness to grasp the syringe as soon as the insertion is made, as is shown in Fig. 3. This enables you to retain it in position, even though the animal subsequently moves about.

In making the insertion it should be noted that the bevel of the needle should always touch the skin and be quite parallel with its surface.

To become proficient in this I would suggest that the beginner use distilled water and practice the operation as circumstances permit before using the tuberculin. This can readily be done while conducting a subcutaneous test.

AMOUNT OF TUBERCULIN

The amount of tuberculin to be injected should under no circumstances be in excess of 2 minims. This dose is best in-

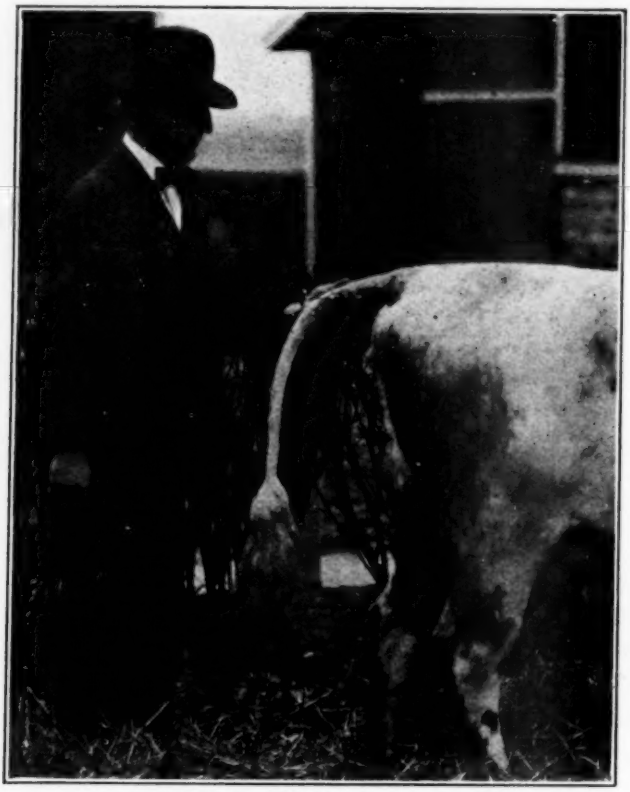

Fig. 3.—Method of holding syringe in position after insertion

jected by a syringe on which a gauge is used. However, should a greater amount be injected unintentionally, the fact should be considered and notation made on the test chart at the time of injection, recording the number or name in order that the animal may be properly identified when making the interpretations.

INTERPRETATIONS OR READINGS [1]

At this point many a decision or diagnosis has "gang agley" and the veterinarian met his Waterloo. However, he should have nothing to fear provided he exercises his judgment and powers of observation closely and is careful in his technique of application. As there are occasions when we can not with safety rely absolutely upon the temperature without other manifestations when conducting a subcutaneous test, so there are isolated occasions when, with a questionable intradermic reaction, we can not depend solely upon it; but, as before said, if we use and exercise due care in giving the questionable animal a rigid physical examination and ascertain its history, this will materially assist us in rendering a decision.

PREPARE FOR ACCREDITED HERD SUPERVISION

It is understood that there are today 7,000 practicing veterinarians who are authorized to conduct tuberculin tests on cattle intended for interstate purposes and to issue the required health certificates. To these veterinarians eventually there will be turned back the 5,000 herds that have already been placed upon the list of accredited tuberculosis-free herds, and in the more distant future the majority of the 28,000 or more herds that are recorded as having passed one clean test in preparation for accrediting and the still many more thousands of herds which are on the waiting list to receive their initial test. With this in view the members of the veterinary profession who have for their object the welfare of the livestock industry and the public health of the United States should properly prepare themselves to take over the burden of this work and to assist in every way possible in the vast undertaking of eradicating bovine tuberculosis.

[1] See Code adopted by United States Livestock Sanitary Association for the intradermic tuberculin test and approved by the United States Bureau of Animal Industry December 6, 1920.—(JOURNAL A. V. M. A., January, 1921, vol. 11, p. 377.)

IOWA DEMANDS HEALTHY HERDS

All cattle shown at the Iowa State fair this year must be from herds accredited as free from tuberculosis, according to a recent ruling by the Iowa Animal Health Commission.

SUGGESTONS FOR HANDLING RECENTLY VACCINATED SWINE TO ELIMINATE BAD RESULTS[1]

By HENRY M. GRAEFE

Topeka, Kansas

AT THE TIME that the discovery of the virtues of anti-hog-cholera serum and virus when used in immunizing hogs against cholera was acclaimed to the swine-raising industry by the veterinary scientists who successfully conducted that research work, it was the opinion of many veterinarians and breeders that by solving this great economic disease-control problem they had practically eliminated all uncertainities in the successful breeding, feeding and handling of hogs. Much to our chagrin, we have found from our field observations that this opinion was an erroneous one, for as sanitarians we have been compelled to face many new and discouraging problems wherein disastrous results have followed the use of cholera virus, both on the farm and at public stockyards, and it is very evident to all that this complicated disease condition, usually termed a vaccination "break," is at the present time much harder to get to yield to treatment than an uncomplicated hog-cholera infection in a herd in the initial stages of the disease.

The necessity of immunizing swine against cholera, as one very important step in the movement of stockers through public stockyards, is apparent to all who have a knowledge of the scientific control of infectious or contagious disease, as it was this immunizing process that opened up a new field of possibilities within the swine-raising industry, viz., the stocker and feeder business. However, it is felt that unless great care is used in handling swine at market centers and on the farm immediately after treatment with serum and virus, many individuals interested in the swine industry will be rather doubtful as to the practicability of handling swine according to the methods now advocated.

While the writer wishes to discuss this phase of the question in particular, it is believed essential to call attention to the fact that not infrequently unfortunate experiences are observed in swine herds vaccinated on the farm which are, in the opinion

[1] Presented at the meeting of the Missouri Valley Veterinary Association, Kansas City, Mo., February 7-9, 1921.

of the writer, caused by some of the same predisposing conditions or like circumstances that are regarded as factors in creating severe losses following the use of cholera virus in the public stockyards.

It is the intention to discuss these problems without any regard for the findings of others, whose results from certain lines of treatment have not been as encouraging, from our observations, as the impression created would lead one to believe. Deliberation on these observations and experiences in the field and the results of experimental treatments applied under actual field conditions have furnished us the data for our opinions and recommendations to eliminate many of these bad results following vaccination on the farm and at public stockyards. It should be obvious to the practitioner that laboratory findings and reports of flattering results from certain sources are no aid to him in the field if, after all is said and done, the livestock man can see no good that has come from the treatment of secondary conditions as advocated by the use of bacterins, as the value of that line of treatment has not been positively proved. Therefore this paper is prepared as an aid to the practitioner in the field, the qualified veterinarian, to get results, and to caution him against the use of biologics of doubtful value, which may cause some reflection on his ability and integrity if their use is advocated.

The high price of land has made the raising of stocker pigs almost prohibitive in the Corn Belt section of our country, while the South, especially Texas, with its cheaper land and various crops, has been called upon to furnish these feeder pigs for the farmers in the Corn Belt to fatten with the grain produced on their valuable land. The demand for this class of pigs during certain parts of the year has been so great that the greatest amount of efficiency in handling has been disregarded in the eagerness to place the pig in the feed lot on full feed with the least expense and waste of time, all of which is a tax on the vitality of the pig just at the time when the system is called upon to withstand the reaction from the use of cholera virus in the immunizing process.

Connaway and other investigators have proved that the blood of swine, immunized by the simultaneous method, will remain virulent for at least 17 days after treatment in instances where only enough of a reaction from the immunization process has

taken place to produce a lasting immunity. Granting that this be the case, it is reasonable to suppose that when an extraordinarily heavy reaction is produced the virulence of the blood may be retained for a considerably longer period. The most important fact that must not be lost sight of is that there is no distinct line of demarcation between an extra heavy reaction following the simultaneous method of vaccination and an atypical or mild type of cholera produced from the same cause. In either instance there can be no doubt as to the presence of the filterable virus of cholera in the blood stream, probably for a period of thirty days or longer, and that fact alone cannot justify anyone in eliminating hog cholera in these so-called "breaks" that occur within that length of time after inoculation.

The use of anti-hog-cholera serum and virus is a success in producing lasting immunity; however, this success depends upon at least three very important factors which deserve mention at this time: First, potent serum and virulent virus in sufficient dosage; second, proper and efficient administration of the serum and virus; and third, hogs to be treated should be healthy, thrifty, and properly handled, dieted and housed before and after vaccination. This is necessary to maintain the proper vitality and to increase the powers of resistance of the body system so that it may be well able to withstand the effect of the reaction produced by the virus used, which has a tendency to reduce body resistance and permit the action of secondary invaders.

The factors under the first two headings need not be elaborated upon, as these points are well taken for granted by the profession as a whole. It is the third factor, pertaining to the reduced body resistance and the devitalizing practices of improperly handling and dieting hogs immediately before and after vaccination, that is, in the opinion of the writer, the cause of a very great percentage of the discouraging problems the profession is called upon to diagnose and eliminate.

It is apparent to the writer from his observations that the production of a permanent immunity not only depends on a sufficient amount of anti-cholera serum and virus administered, but equally important is the power of the animal system to produce a large amount of antibodies during this immunizing process. Decreased resistance causes failure on the part of the animal system to be able to produce these antibodies, and

without this natural cellular fortification against cholera virus the serum or artificial protection is inadequate. This enables the virus to produce an attenuated, atypical, mild or chronic form of cholera in which a probable toxemia of low type exists in the animal system for an extended period of time, which is not sufficient to cause death, but further reduces the body vitality until secondary organisms which ordinarily are nonpathogenic to the thrifty hog assume a pathogenic action and produce complicated conditions capable of producing death from pneumonia, gastritis or enteritis. Nephritis, cystitis, pericarditis, pleurisy or similar conditions may also be present.

Assuming that this explanation of these conditions is reliable, it is fallacy to advise the farmer that he has "infectious pneumonia," "swine plague," "necrotic enteritis," "mixed infection" and numerous other misleading diagnostic terms for diseased conditions. Further, to advocate the use of biological products which may in many instances contain an unstandardized bacterial count of varied bacillary strains that may or may not be pathogenic in character, and in many instances probably not of similar pathogenic action to those producing the secondary condition in the swine under observation, is not in line with proper disease-control measures and serves to offer a source of criticism of the veterinarian when no results are obtained from the use of that treatment.

Again, there is one fundamental principle in the treatment of disease that demands attention, and that is the removal of the cause of the primary trouble, which in these instances can not be done by bacterin treatment, because it does not produce the specific antibody that is effective against the cholera virus injected as a part of the simultaneous treatment.

It is granted that in a very small percentage of cases, and only in those observed a considerable period after vaccination, some of these ordinarily secondary infections may become highly pathogenic after passing through the system of an animal of low resistance in a herd, and in this highly pathogenic stage be capable of producing an infection which is in all probability primary instead of secondary in origin. Usually only a small percentage of animals in a herd become infected, and in those that do, the writer has never observed remarkable results from the use of the bacterin treatment. It would appear that if these organisms, which are in constant contact with the intestinal mucosa, can not stimulate cell activity when they are

normally present in the alimentary tract, no virtues could be obtained from a bacterin prepared artifically from the many strains which may or may not be the causative factor. It may be that if possible to obtain an autogenous bacterin some good might come from such treatment in primary conditions, for it is believed there are some virtues in the proper use of good bacterins when properly indicated, in some disease conditions that are not peculiar to swine.

The writer has observed with considerable interest the many varieties of bacterins on the market, some at least being of questionable value. The confiding practitioner should be very positive of the value of such biologic products before he attempts to use them and to advocate their use, for we should not forget that usually the filterable virus is the principal offender with which we have to deal and that cholera appears in obscure forms. The use of what should be considered a worthless bilogic nostrum when used to correct such conditions will only detract from the ability of the local practitioner in many instances.

Assuming that insanitary surroundings, decreased vitality and reduced resistance of the animal body are the predisposing factors in causing the usual losses encountered, it is evident that more stringent requirements for the handling of stocker pigs at market centers should be inaugurated and more instruction and education of the farmer and feeder as to the proper caring for recently vaccinated swine be carried on.

Pigs are usually loaded through dirty, infected stock pens into cars with from 3 to 6 inches of dirt on the floor, and subjected to a debilitating trip to the market center, there to be engorged with corn and water for a "fill" with very little rest, and the next day vaccinated, sprayed and reloaded for another fatiguing trip back to the farm and into the fattening pen. All during this time nothing has transpired but that which has a tendency to reduce the vitality of the pig and make it more susceptible to a heavy reaction from vaccination and the introduction of the secondary invaders. The engorgement with corn creates a digestive derangement which is debilitating; likewise are the spraying, rough handling and riding on the cars, especially during certain seasons of the year. Some of these abuses can be eliminated in a practical way, and it is the veterinarian's and the sanitarian's duty to advise and educate against these abuses.

However, there is another point which, in the opinion of the

writer, if eliminated by educational means, would serve more to prepare the pig so as to be better able to withstand the immunizing process without showing symptoms of sickness. A uniform impression seems to prevail that, immediately the pig arrives from the yards after vaccination, if he is not started on a full ration of corn both time and money are being wasted in finishing the hog for market. The result is a repetition of the digestive disturbance in from five to ten days following vaccination, just at a time when all the recuperative powers of the pig are needed to withstand the reaction from the immunizing process. Failure to produce an immunity under these circumstances results in an atypical type of cholera which in most instances is complicated with some of the secondary conditions or complications already referred to. With the simultaneous inoculation of pigs with serum and virulent virus, either an immunity is produced or cholera is the result, and the course of a vaccination cholera break in a herd depends on the percentage of animals which have failed to undergo the proper immunizing process. Therefore it is considered that all swine that have not experienced what is termed a normal reaction from the cholera virus administered will show some evidence of symptoms of disease, and this fact determines the extent and seriousness of the bad results in the herd.

Caution against the vaccination of swine on premises where sanitary conditions are not conducive to the maintenance of increased body resistance, or in instances where unthrifty, undernourished or parasite-infested herds are observed, is essential. It must be remembered that the virulent virus, even when used with a potent serum, is capable of causing body reactions that are a tax on the animal system; therefore it is quite easy to "set the animal on fire," as the layman usually expresses himself, if the animal system is unable to recuperate from the immunization effects. A case report will better illustrate this point.

One hundred high-grade Chester White shoats, averaging 90 pounds, and 50 pigs just weaned were treated with serum and virus on November 24, and at the time of vaccination the veterinarian remarked as to the healthy and thrifty appearance of the smaller pigs. Six weeks later the veterinarian requested the writer to accompany him to observe these pigs, as they were reported as not doing well. The larger shoats had apparently done fairly well following the treatment, but not so well as could be expected. The pigs had made no gain, abdomen distended,

voracious appetite and very rough coat of hair, the appearance denoting marked unthriftiness. About 20 per cent died the first three weeks after treatment. At first excessive amounts of buttermilk, tankage and corn were presumed to be the predisposing factor; however, upon postmortem examination, large quantities of intestinal parasites were observed that had also been responsible for the depletion of the system and made the herd an unfit subject for vaccination.

In this connection the suggestion is offered that swine should not be vaccinated until they weigh 60 to 75 pounds, if the vaccination procedure can be deferred that long, and then sufficient serum with at least 1 to 2 c.c. of virus be used, as the smaller pig has not the power to counteract the virus successfully, especially if infested with parasites which will multiply rapidly if it is experiencing a heavy vaccination reaction.

Attention should also be called to the necessity of properly determining the absence of cholera infection at the time of vaccination. Close observation of the herd and history and enough temperature readings to satisfy the operator of the healthy status are absolutely necessary. If this is not done it will place the veterinarian in a rather embarrassing position if the infected swine in the herd begin to die three or four days after vaccination. The report of the health status of vaccinated herds to the regulatory officials serves many times to absolve the practitioner from blame when complaints are made of bad results following vaccination in infected herds. Suggestions are also offered that local practitioners defer the treatment of swine herds on the farm in instances where it is considered that the resistance to disease is low until such time as the herd is placed in a more healthy status. The removal of parasites and the correction of insanitary conditions of premises and dietary abuses will accomplish the desired result in a remarkably short length of time, and the veterinary practitioner eliminates the chance from this cause of having his efforts criticised by bad results following the treatment.

Pigs, whether vaccinated in the yards on the farm, should be prepared for treatment by giving them at least 24 hours' rest in comfortable, clean, sanitary pens to regain their recuperative powers. During this time they should be fed only a short ration of soft feed and then sprayed following treatment. They should be given warm quarters in which to dry off, then comfortably bedded and loaded for the trip to the feed lot. The farmer

should then be given written instructions as to the proper care from 14 to 21 days after inoculation, and advised what the results will be in all probability if he does not heed those instructions. Then, if bad results do occur, the individuals who treated the animals are not immediately placed on the defensive.

As a suggested line of instruction to the farmer, I wish to submit an extract from one of the forms used in our office in compiling data on stockyard shipments. These instructions are incorporated in the form:

INSTRUCTIONS TO SWINE FEEDERS

Note carefully the condition of your hogs at unloading time. If they are tired, give them rest. Their vitality is low and their constitutions can not resist disease. Do as much practical cleaning and disinfection of your hog lots and quarters as you can before placing stocker pigs in the feed lot. Furnish fresh, clean drinking water, and admit all the sunlight possible. Feed light feeds with a small amount of corn when starting recently vaccinated pigs on feed. Gradually increase corn to full feed in from 14 to 21 days. *Do not start pigs abruptly on large feeds of corn*, especially new corn; it taxes their digestion, weakens their constitutions and causes breaks from vaccination that are the fault of neither the serum or virus nor of their administration.

Recently immunized swine must be properly fed and handled to prevent bad results following vaccination. This is as essential as potent serum and virus. No human recently immunized against typhoid would think of eating a large, greasy steak without expecting to be sick afterwards. The pig does not understand that, but the owner should.

If you have a break, call your local veterinarian and report your trouble to the State Livestock Commissioner and to your commission firm at the yards.

SUGGESTED LINES OF TREATMENT FOLLOWING BREAKS

History, symptomatology, virulence of the break and character of postmortem lesions should be given careful consideration before making recommendations to correct the condition. It is obvious that the apparent predisposing causes for this vaccination relapse should be determined and alleviated. Prompt correction of errors in diet, insanitary surroundings and uncom-

fortable sleeping quarters, and the segregation of all animals showing symptoms of sickness, are essential. Many times these precautions are sufficient to control the losses in a satisfactory manner.

Frequent disinfection should be practiced, and a mild intestinal antiseptic in the drinking water is beneficial. All segregrated animals should be treated with extraordinarily large doses of anti-hog-cholera serum, but no virus, preferably injected intraperitoneally.

The owner should be advised that his losses will depend considerably on the severity of the reactions being produced and that the percentage of breaks may vary from 5 to 80 per cent. In many instances these breaks can be satisfactorily controlled by strict attention to the dieting and handling of the herd. If the disease assumes an acute or more typical type of cholera, and affects a large percentage of the herd in a short period of time, it is advisable to recommend the immediate revaccination of the entire herd with serum alone.

The use of misleading diagnostic terms in such cases and also a treatment of questionable value is regarded as an injudicious policy. It is believed that the farmer should be acquainted with the true facts and impressed with the necessity of preventing these unfortunate occurrences, for the trouble in a great measure is preventable if sanitary and proper handling instructions are observed.

The writer is of the opinion that in most instances the value of bacterins following vaccination relapses is questionable. The treatment of secondary conditions is positively against the fundamental principles in the treatment of disease, and unless the presence of the filterable virus is eliminated from these conditions successful results can not be obtained from such lines of treatment.

During the past two years reports have been received of the results following the vaccination and shipment of swine from the various public stockyards to points in Kansas. In many instances bacterins, in addition to the simultaneous treatment, were used. However, it has been observed that, regardless of the use of bacterin treatment, if the animals were subjected to a long debilitating trip on the cars or otherwise handled to lower the body resistance, considerable bad results would be reported. Several reports indicated that some of the heaviest losses occurred in swine subjected to the triple treatment, which in-

dicates to the writer that this is of questionable value. The impression has usually prevailed in studying the subject of serobacteriological therapy that the use of bacterins and vaccines has served more for the purpose of immunization against disease, while the use of antitoxic serums has been more effective in combating infection which has gained entrance into the system. This being the case, it would appear that a bacterin treatment would be contraindicated for the same reason that virus is contraindicated in revaccinations following breaks, as the body cells are at that time taxed to their capacity in the production of antibodies, and what is needed is an antitoxic serum artificially introduced to augment the antibodies produced by cellular activity, instead of further stimulation, if the usual stock bacterins are capable of producing reaction, of the already overworked body tissues to combat secondary infections which theoretically will create more damage instead of repair to the body forces engaged in the fight against the diseased process, at a time when they are least able to respond to such reactions.

In order to substantiate some of the statements made in the presentation of this paper, it is considered advisable to present a case report which should be of value in determining the merits of the arguments put forth.

G. A. Bushong, Richland, Kansas, raises about 100 head of high-grade red pigs each spring and fall. The writer investigated a condition occurring in the 1918 spring pig crop wherein the pigs, six weeks after weaning from immune mothers, contracted a cough, spasmodic respiratory action, rough coat of hair, gummed eyelids, inappetence, general unthriftiness, weak, straggling gait, and occasionally a profuse diarrhea. Postmortem examination indicated injection of lymphatics, slight petechiations of some internal organs, especially the kidney and bladder, petechiation and subpleural ecchymoses on the surface of the lung, and a lobular or broncho-pneumonia which usually solidified from one-third to one-half of the alveolar space of both lungs. Twelve were dead and eight were sick. Treatment, 1 c.c. serum per pound and 1 c.c. virus. Eight sick pigs were given bacterins in addition to serum and virus. Healthy herd, two off feed temporarily three days after vaccination. No further bad results. Six of the sick pigs died; the other two made unprofitable feeders, never regained sufficient thriftiness.

The fall pigs in 1918 showed the same condition six weeks after weaning. Pathological specimens taken by the writer to a commercial laboratory. Diagnosis, hemorrhagic septicemia. Bacterin treatment was recommended and was administered when 5 pigs showed sickness. No serum or virus was used.

Owner requested serum and virus vaccination two weeks afterwards, as 18 more were sick. Loss stopped immediately. Six sick animals recovered, of which 3 made complete recovery and 3 continued unthrifty.

In 1919 the spring pigs showed sickness eight weeks after weaning. Cleaning and disinfection of premises completed prior to farrowing time. By agreement with commercial firm, triple treatment administered simultaneously to be used. Owner reported sickness in 3 pigs. Swine plague bacterins ordered by wire. On making visit to premises to administer treatment, entirely different symptomatology observed, so much so that owner advised me hogs were not affected with same disease. Examination disclosed profuse fetid diarrhea and marked intestinal disorders without any pneumonic symptoms. Postmortem showed numerous diphtheritic and necrosed areas in both small and large intestines, only slight pneumonic lesions in lungs and slight petechiation of various internal organs. A different complication of the atypical cholera. Swine plague bacterins returned and mixed infection used in connection with serum and virus. Herd treated when 6 pigs were sick. Second dose of bacterins five days later; 11 pigs sick at the time. Approximately two weeks after treatment the disease had run its course, 21 having sickened, of which 18 died, 2 partially recovered and 1 made complete recovery.

The fall pigs in 1919 showed sickness five weeks after weaning. Premises cleaned and disinfected before farrowing time. One pig reported sick and used for postmortem, which showed considerable enteritis as a complication of a mild type of cholera. Large doses of serum alone used. Two pigs sickened two days after treatment; recovered completely after short illness. No further loss.

The spring pigs, 1920, were treated with serum alone ten days after weaning. No evidence of disease occurred at any time. All but the first crop of pigs were given copper sulphate in drinking water, and proper dieting and sanitary instructions were carried out.

From this series of experiments carried out in the same hog lot on five succeeding crops of pigs it appears that the use of large doses of serum alone tends to give better results than any other line of treatment. The opinion is advanced that the use of virus is contraindicated, as it produces a body reaction when the body tissues are already devitalized and can not properly respond to this action. The same should be true of bacterins when they produce a body reaction. Therefore any attempt to counteract or immunize against the low toxemic condition produced by mild cholera infection must be of a passive nature. If

this condition were of the more acute type, this theory would not apply.

In summarizing, the following salient points must be observed to eliminate bad results following vaccination:

1. Potent serum and virulent virus must be properly administered in sufficient dosage.

2. Swine, to be fit subjects for treatment, must be handled, fed and sheltered in clean, sanitary premises that are conducive to the production of an increased resistance to disease.

3. Clean, comfortable premises and quarters, and small rations of light feeds with very little or no corn for from 14 to 21 days after treatment, are essential to eliminate losses following vaccination.

4. Segregation of all sick animals and revaccination with large doses of serum are advised when breaks occur. Revaccination of entire herd with serum depends on history, symptomatology, virulence of break and character of postmortem lesions. The plentiful use of disinfectants is advocated.

5. The use of virus in revaccination is not advocated, as a stimulation of body tissues tends to exaggerate the diseased condition. Counteract the primary disease process by passive immunity, and secondary invaders will in most instances be destroyed by whatever cell activity the body is able to produce.

"SOME BEAN"

Goldsmith's well-known lines to the effect that "the man recovered of the bite—the dog it was that died" have a counterpart in an incident recently reported from Alabama, according to the following account which the *Journal of the American Medical Association* quotes from the San Francisco *Chronicle:*

HUNTSVILLE, ALA., January 20.—The claim of Joseph Jones to hospital attachés that he had "some bean" was borne out today when his story that he had been kicked by a mule on the head and that as a result the animal was lying helpless with a broken leg was investigated and found to be true. Jones said his way was blocked by a stray mule and he made a threatening gesture to frighten it away. It refused to stampede, however, meeting the assault with a well-directed kick to the brow. The mule's leg was broken in two places. It was pronounced a helpless cripple and shot. Jones will recover.

ANTISEPTICS IN SURGERY [1]

By JAMES B. ASHCRAFT

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THE SUBJECT of antisepsis is relatively of more importance in our branch of medicine than in others, due to the unfavorable conditions as to asepsis that we are called on to overcome, therefore calling for a greater use of antiseptics.

When microorganisms were discovered and their relation to disease was proven, the medical world turned to the pharmacopeia in search of the ideal antiseptic, one that, while harmless to the body cells, would be capable of preventing the growth and development of all disease germs. It was very soon realized that "no such animal existed;" that while some antiseptics were quite effective against some organisms, they failed when tested with other microbes. For example, mercuric bichloride, a powerful agent when applied to *Bacillus anthracis*, is helpless against the tubercle bacilli. This led to a search for the antiseptics that would be more or less specific for each organism, and for a few germs specific antiseptics have been found.

A great number of drugs have been placed in the antiseptic class and a strong faith built up as to their efficiency. In the past and also today we have depended on these chemicals, often placing too great a trust in their value as aids to healing.

In surgery we use antiseptics mainly for preparing our instruments for operation, for preparing the field of operation, for treating skin diseases, and for treating wounds, both surgical and accidental, the last use being without doubt the commonest in ordinary practice.

There is a tendency toward the use of strong, powerful agents, a sort of kill-or-cure spirit in the use of our antiseptics. Every experienced practitioner comes to realize that after the first few treatments wounds heal faster, the less attention given them with this class of antiseptics; that in a school clinic or a beginner's practice are found the slowest healing wounds, because of an excess of zeal which can only be satisfied by filling the

[1] Presented at the ninth annual convention of the Philippine Veterinary Medical Association, Manila, February 4 and 5, 1921.

squirt gun and listening to the swish of antiseptics on the wound surface.

What is the explanation of this? We are slow to admit it, but the answer we have known for some time. It is that the new cells of the granulation tissue are more easily killed, are less viable, than are the microorganisms commonly present, and that every time the average antiseptic in the strength ordinarily used is applied there is an appalling death rate of the reparative cells, adding to the wound surface an excellent medium for bacterial growth. And those cells that are not killed outright are so devitalized that their multiplication is slowed and healing delayed, that more infection is often introduced, and the protective secretions are washed away. On the other hand, to do away entirely with the use of antiseptics for wound treatment and trust entirely to the natural protective powers of the body, aided only by biologics, is folly, as often the opsonic index is so low that the animal would be slow to recover.

One of the few good results of the last war was the progress made in the use of antiseptics. Necessity was a stimulus to the development of a better system of antiseptics. In the armies there was a constant stream of incoming cases to already overcrowded hospitals, so that it was imperative to speed up reparative processes. Time was the big factor, and cases that could in ordinary practice be allowed to get well leisurely had to be moved through and discharged in the least time possible. As a result we have all heard of the revolutionary effect upon wound treatment that such investigators as Carrel, Dakin, Morrison and others brought about.

When choosing our antiseptics and our methods of application we need to correlate our knowledge of tissue repair, of how antiseptics derive their action and their individual characteristics. In wound treatment we should appreciate the means by which nature is seeking to repair the injury, so that with our antiseptics we can aid and not hinder her.

Following injury a few hours after hemorrhage has stopped, a clear fluid can be seen covering the wound surface. This is the lymph, which has escaped from the ruptured capillaries and which is increased by the engorgement of the immediate surrounding blood vessels. It contains the greatest amount of the body defensive forces at this time, such as the complement-fixing bodies, agglutinins, precipitins, etc. Twenty-four hours later the

character of this fluid is changed. It becomes cloudy, creamy, viscid, which indicates that infection is present. The cloudiness is due to the phagocytes, lymphocytes that have come to the wound surface and started battle with the bacteria. Small granulations are seen protruding over the surface of the wound. These are made up of connective-tissue fibroblasts that are rapidly dividing as a result of irritation. As long as irritation is present granulation continues, and were it not for the ingrowing protective surface epithelium it would continue indefinitely. These breeds coalesce, and in so doing many little spaces are formed which furnish safe harbors for infection, that are very difficult for the average antiseptic to invade.

Antiseptics accomplish their action on microorganisms by different processes. Some by coagulation, in which the albumen within the bacteria is coagulated; for example, mercuric bichloride, silver nitrate and formaldehyde. By toxicity, having a toxic effect upon bacteria; e. g., creolin. By oxidation; e. g., potassium permanganate, potassium chlorate and hydrogen dioxide. By reduction, taking away oxygen from the microorganisms; e. g., zinc chloride, mercuric bichloride. Change of reduction in the wound. The acids act in this way, dissolving the cell membrane and allowing the cell contents to escape; e. g., organic acids. By dehydration, the withdrawal of water from the cells; e. g., strong salt solutions and alcohol.

We have all read of the chloramin group of antiseptics, of their efficiency, of the method of preparation and the manner of applying them. As to their effectiveness they have proved nearly ideal; they have little toxic effect on the new formed cells; they dissolve necrosed tissue; and, due to the continual escape of the gas chlorin, which does not coagulate albumen, they reach every part of the granulating wound. It is said that a 2 per cent solution of chlorazene in 5 minutes or dichloramide in 30 seconds is equal to the action of 1 to 1,000 mercuric bichloride for 3 hours or 2 per cent phenol for 24 hours on staphylococci. But the obstacle preventing the wholesale adoption by the practitioner is the difficulty of preparation, in securing the exact amount of free chlorin desired, and a neutral reaction. There is also the difficulty in their use, in securing continuous irrigation with tubes and supply tanks. Some of the drug companies are now supplying them in tablet form, which does away

with the task of preparation, and they apparently are giving good results.

A modification of the method of preparation and of the manner of application is the following formula:

Chlorinated lime	220
Sodii carbonatis	110
Sodii bicarbonatis	88
Water to make	11¼ liters

The approximate cost per liter at Manila prices is 0.05 peso. The method of preparation is to put the sodium carbonate and sodium bicarbonate in a large jar, add water (about one-half), then the chlorinated lime, and fill the jar to 11¼ liters; shake well, and allow it to stand until all settling is completed. This takes about 24 hours. Then syphon off the clear liquid into another jar. In applying, use a dose syringe and thoroughly wash out the wound once or twice daily. The clean character and slight amount of discharge and the rapid growth of granulations are both gratifying and surprising. I have used it for some two years, on wounds of all types, using it as the first, last and only dressing.

When preparing the field of operation a good plan is to clean the area well with soap and water. The addition of antiseptics to soap does not, according to experiments by Norton, add to their value. In fact they interfere with the very good antiseptic qualities of the soap itself. After shaving the hair apply a boric acid pack for 24 hours. For those cases when time is lacking clean with 70 per cent alcohol and paint with tincture of iodin.

An excellent dusting powder that is not expensive and is easy to make is 1 part of creolin to 50 of boric acid. It is quite effective as an antiseptic and also repels flies.

For treating open joints in which infection has gained entrance a 1-to-500 solution of mercuric bichloride and glycerin is the best agent I know of.

When sterlizing instruments I like best to boil them for 30 minutes, then pour off the water and cover them with a saturated solution of boric acid.

In our use of antiseptics we should steer a sane middle course, not going to extremes, either in the direction of excessive, strong disinfection, or the opposite, that of discontinuing the use of the many valuable agents we now have or may expect to see discovered in the future.

CLINICAL AND CASE REPORTS

(Practitioners and others are invited to contribute to this department reports of unusual and interesting cases which may be helpful to others in the profession.)

TWO UNUSUAL CASE REPORTS [1]

By F. B. HADLEY *and* B. A. BEACH
University of Wisconsin, Madison, Wis.

BACTERIAL ANAPHYLAXIS

THE ANIMALS which constitute the subject of this case report consisted of thirteen calves ranging in age from one to fourteen days. The owner had called a veterinarian to prescribe for them, as several had previously died from scours, and he wished to prevent further losses. The practitioner injected each with 2 mils of a commercial calf scour mixed bacterin. The injections were made subcutaneously.

Within twenty minutes all but four of these calves were quite visibly sick and showed the following symptoms: Inspiratory dyspnoea, great depression, and weakness. A semi-comatose condition gradually developed from which two of the calves failed to recover, death occurring in a few hours. These two calves were the oldest of the lot. At first it was thought that all the animals would die, as practically every one was prostrate. Stimulative treatment was given at once. This was successful as shown by the fact that the remaining eleven were apparently normal in twenty-four hours.

On the fourth day after the injection of the bacterin another calf died, but it was a weakling and in the opinion of the attending veterinarian, Dr. Lillesand, may have succumbed from natural causes. Ten days subsequent to the treatment all the remaining calves appeared to be normal.

In order to determine the cause of these very unusual symptoms and also the cause of death, a careful postmortem examination was made on the first calf which died. It revealed marked congestion of the lungs and kidneys, but all other organs appeared to be normal. As it seemed likely that the bacterin was responsible for the reaction, a rabbit and a guinea-pig were each injected subcutaneously with 1 mil, and a calf with 3 mils

[1] Published with the permission of the Director of Wisconsin Agricultural Experiment Station.

of the product. To be certain that a representative sample of the bacterin was available, one vial from each of five packages containing six 2-mil vials was mixed, and the stated dose taken from the pooled bacterin. No reaction was observed in any of these experimental animals, which indicates that the thirteen calves must have been extremely sensitive to the bacterin. No bacteriologic study was made of the bacterin.

It is reasonable to conclude that these calves had been sensitized as a result of a mild infection with at least one of the same type of organisms contained in the product. This bacterin contained *B. coli communis* 60 per cent, *B. paracoli* 30 per cent, and *B. abortus* 10 per cent. The reaction was probably caused by protein substances produced as a result of disintegration, or autolysis, of the dead bacteria in the bacterin. It was hastened by certain defensive agencies (antibodies) of the body which have been demonstrated to be capable of splitting bacteria and their products. These defensive agencies were active because of a previous natural infection with the same type of organism. Such a reaction as has been described is termed bacterial anaphylaxis.

Occurrences such as this seem to indicate that stock bacterins of all kinds should be used with a great deal of caution. This experience is another argument against the indiscriminate use of bacterins. Had calf scour serum been injected into these calves instead of the bacterin, it is probable that no bad results would have followed.

HEMORRHAGIC SEPTICEMIA

In this herd there were twelve head of yearling cattle. These had been dehorned by a farmer, who makes this work his business. A regular dehorning saw was used and the wounds resulting from the operation were disinfected with a coal-tar dip mixed with water in the proportion of about 1 to 4 or 5. Practically no hemorrhage occurred.

On the morning of the second day after the animals had been dehorned, or within 36 hours, five had died and one more was so sick that the prognosis of the attending veterinarian was very bad. All the other six appeared perfectly normal, and at no time thereafter exhibited any sign of sickness.

The symptoms were not marked in any case. Dullness, cold extremeties, rough hair coat, lack of appetite, little or no elevation of temperature, and inability to walk were observed. The

litter about the dead animals was not disturbed, indicating tranquil rather than convulsive death.

The history pointed to the dehorning operation as the indirect cause of these sudden deaths. Consequently, the head of a dead animal was brought to the writers, with the request that it be examined for the purpose of establishing a diagnosis. Careful examination of this head failed to reveal any lesions except the operation wounds. A small opening, which communicated with the frontal sinus, was noted at the base of the left horn process, but the mucous membrane lining this sinus was not inflamed. The meninges and nasal mucosa also failed to reveal any abnormal change.

As the examination of the head gave negative results, the owner was informed that a diagnosis could not be made without an opportunity to inspect other organs of a carcass; so the next day he brought in the carcass of another animal, and a detailed postmortem examination was made. The chief lesions found were hemorrhages beneath the endocardium and pleura. The blood-shot appearance of the lining of the heart was especially well marked and typical. The spleen and other abdominal organs were normal. Portmortem examinations by Dr. E. Johnson on several of the other carcasses revealed similar heart lesions, also subserous hemorrhages of the intestines, the latter in some cases being more marked than in the heart.

A diagnosis of hemorrhagic septicemia was made. It seems fairly certain that the animals were in the incubation period of this disease when they were dehorned, or at least were harboring the *Bacillus bovisepticus*, and that the defenses of the body against disease were weakened as a result of the operation, thus giving these pathogenic organisms an opportunity to become active. The possibility exists that the saw was infective, that is, the object on which the infectious organisms were brought into the body. In view of the very short period of incubation for hemorrhagic septicemia, which according to Hutyra and Marek in inoculation and feeding experiments is from 6 to 24 hours, there is some reason to attribute the source of this outbreak to organisms on the saw.

The practical lessons which these case reports teach are (1) the desirability of making a complete postmortem examination before attempting to make a diagnosis, even though circumstantial evidence points strongly toward a certain thing as the cause of death; (2) the value of experimental animals in establishing

a diagnosis; (3) the need of care in selecting any biologic agent for therapeutic purposes; (4) the danger attending the indiscriminate use of stock bacterins.

A RARE FORM OF UROLITHIASIS ASSOCIATED WITH CLONIC SPASMS OF MUSCLES (CHOREA) OF THE POSTERIOR LIMBS OF THE DOG

By WILLIAM J. LENTZ

University of Pennsylvania, Philadelphia, Pennsylvania

HISTORY

DACHSHUND, male, three years old, had distemper when it was seven months old. For a period of about two months before admittance to hospital, exhibited, as per words of the owner, a peculiar bobbing up and down of the rear end of the body which was becoming gradually more marked, and was much worse some days than others. At such times the animal frequently moaned and cried as if in pain. The owner also called particular attention to the fact that when the animal attempted to urinate it was unable to hoist the leg, would make frequent attempts to pass its water, and would sometimes stand for more than half an hour at a time in one place and strain and just a little urine would be passed every now and then, which for the last three weeks was blood stained, and in the last few days pure blood was passed now and then. Also spoke of animal straining a great deal on defecation so that the rectum seemed to be forced out some.

DIAGNOSTIC INQUIRY

Because of the strangury and hematuria, a urethral calculus was first suspected, but on palpation no retention of urine could be detected and a catheter of fairly large diameter passed into the urethra was not arrested at the usual point of lodgment of urethral calculi, that is, just at the posterior extremity of the penile bone, but passed with ease into the bladder. Next, because of the frequent attempts at micturition, the strangury, the hematuria and the associated tenesmus and the tendency to prolapse of the rectum, a vesical calculus was thought of, but digital examination of the bladder per rectum and palpation through the abdominal wall failed, even when under ether, because of a round, full abdomen, to reveal the presence of such.

The prostate gland on examination was found to be normal, therefore it was decided to resort to an X-ray examination. The photograph (Fig. 1) is that of a skiagraph (lateral view), which faintly shows three calculi (calculi of oxylates or phosphates give the best shadows. See Fig. 2). The diagnosis of vesical calculi having thus been established, prepubic cystotomy (lithotomy) was decided upon.

OPERATIVE PROCEDURE

The animal having been anesthetized and the surgical field suitably prepared, the penis was held aside by an assistant and an incision of the abdominal wall was made in the median line, about 1½ inches in length, and about 1 inch anterior to the symphysis pubis. The bladder was then partly drawn through the opening and surrounded by gauze packs. The organ was rotated slightly, and a point on the lateral surface was selected as the site for the incision, because the blood vessels are least numerous here, and because it is obvious that an incision in

Fig. 1.—Radiograph of dog in case report, showing three calculi in bladder. These calculi were composed entirely of organic matter termed cystin and hence do not stand out so clearly as those in Fig. 2

the ventral surface was to be avoided if possible. Before making the incision two cat-gut sutures placed about 1 inch apart were passed partly through the bladder wall, so as not only to steady the organ and prevent subsequent retraction but chiefly so that the incision which was made between these sutures might be religiously closed, owing to the tendency of the organ to contract when empty. The calculi were removed through the incision made, one being found somewhat firmly fixed in the neck of the bladder and might have been overlooked had not the X-ray plate not only demonstrated the presence of three calculi but also given some idea as to their location. The shadow just posterior to the penile bone (Fig. 1) is evidently simply an artifact, because diligent search by passing several catheters of different diameter and forceful injections into the urethra and having fluid pass through incision in bladder failed to produce a fourth. Interrupted cut-gut sutures were used to stitch up the bladder incision and were placed one-eighth of an inch apart, the lips of the incision being inverted and the stitches passing only through the serous and muscular coats.

Incidentally, I would like to mention the operative technique on a case of urethral calculus in the male, brought to the hospital about six months ago, the diagnosis having been made by passing

Fig. 2.—Radiograph of posterior part of body of dog, showing bladder filled with calculi composed of calcium phosphate

the catheter and having passage of same checked at the posterior end of the penile bone. Now it is obvious that an operation on an impacted urethra to remove one or several calculi may necessitate a subsequent operation at a future date, because if there are calculi in the urethra there may be others in the bladder. With this thought in mind, both urethrotomy and prepubic cystotomy were performed in this particular case, and by flushing the urethra through the incision many calculi were washed out of the incision in the bladder wall. Therefore, in all cases of urolithiasis it would seem to me advisable, before an operation is attempted, first to resort to radiography, bearing in mind that one calculus, for instance in the urethra, presupposes the possibility of others which may not only be in the urethra but in the bladder, ureters, or even in the pelvis of the kidney.

PHYSICO-CHEMICAL EXAMINATION

Figure 1 gives some idea as to the size of the calculi. The largest was found to be three-fourths of an inch in one direction and one-half inch in another, but was relatively light in weight, weighing only about 25 grains. The calculi are yellow, soft, and when dried friable, and feel greasy to the touch. A portion of one fused on platinum foil was found to burn with a bluish-green flame and entirely burnt up without leaving any residuum, demonstrating that they are entirely organic in structure. A portion placed in ammonia was found to be entirely soluble, with a production of six-sided crystals when the solution evaporated.

Uric-acid crystals are also dissolved in ammonia, but on evaporation of the solution there is formed ammonium urate, which remains as an amorphous residue. It was found that the calculi were entirely composed of what is termed cystin, which is found infrequently in both acid and alkaline urine of men and dogs. Of the origin of cystin little is definitely known. It is an abnormal constituent of urine and, according to some investigators, it is supposed to result from the action of putrefactive microorganisms upon the albumen of food in the intestinal canal and thence absorbed and voided by way of the urine. The animal alkaloids cadaverin and putresin are accompaniments of cystin in the urine; therefore, according to these investigators, urine containing cystin also always contains the alkaloids mentioned, and "cystinuria" is regarded as evidence of a definite

infectious process. Cystin itself is not found in the feces, and some few investigators seem to think that cystin and these alkaloids are probably formed in the tissue of the body and therefore that a causal connection does not exist between these two conditions. They regard cystinuria essentially as a metabolic anomaly, the result of a specific deficiency of the oxidation processes taking place in the body. Cystinuria may be temporary, but as a rule is permanent and seems sometimes to be hereditary. Clinically it is of interest in so far as its continued production may give rise to the formation of calculi. Unless it occurs in this form its presence will scarcely be suspected.

In view of the assumption that cystinuria and ptomainuria may coexist and are probably the result of the action of microorganisms in the intestinal canal on the albumen of food, and the possibility that in this particular case which I have the pleasure to report cystin calculi might again form, I prescribed intestinal antiseptics such as salol, and restricted the diet to barley and oatmeal gruels. At the present time, three months after the operation, the animal is apparently in the best of health and the spasms have disappeared. The clonic spasms, commonly diagnosed as chorea, may, therefore, either be considered as neurosis, occasioned by the same poisons which brought about the production of cystin, or the spasms were simply due to reflex irritation by the calculi in the bladder. The thought suggests itself that some cases of chorea, so called, might be due to the action of such poisons as cadaverin.

HEMORRHAGIC SEPTICEMIA

By LAWRENCE L. GLYNN, *Monte Vista, Colorado*

WE ARE READING so much conflicting material about the use of bacterins at various experimental stations and the results of such use that it may not be untimely for practitioners to report cases. We need not jump to the conclusion that the use of the bacterins has been the cause of the effects obtained, but sufficient data may be found on which to base conclusions.

CASE REPORT NO. 245

Navin's cattle ranch, 12 miles northwest of Center, Colo., winter headquarters, native hay being fed in corral. Forty-one head of purebred Shorthorns being kept in corral. Corral wet from melting snow. 'Artesian water for stock in troughs. Rest of

cattle out in pasture also being hayed. These 41 head kept in corral to calve.

On my arrival 23 had calved and 4 calves had died showing bloody diarrhea. Three calves sick. Symptoms, bloody diarrhea, watery discharge from eyes, subnormal temperature. Diagnosis, hemorrhagic septicemia; diagnosis not proven.

Treatment, 4 c.c. hemorrhagic septicemia bacterin from a commercial laboratory given to the 3 sick calves, and 2 c.c. hemorrhagic septicemia bacterin to 16 apparently well calves. Syringe and bacterin left with instructions to give 4 c.c. next day to the 3 sick calves and to any of the 16 developing symptoms, and to give 2 c.c. to all calves from the 18 cows yet to calve when the calves are two days old. No change was made in the handling of the case, in feed or location, and no other treatment was attempted. (I felt that any other treatment or change I might suggest would probably not be carried out.)

Results: One sick calf died; 2 recovered; none of the 16 developed any marked symptoms. Seven calves were born and received bacterin and developed no symptoms. Foreman then was absent 5 days, during which 3 calves were born and received no treatment. These 3 died, showing a bloody diarrhea. Eight calves were subsequently born and received 2 c.c. of the bacterin and developed no symptoms.

I admit that this is not the proper way to handle an outbreak of this disease, but circumstances alter cases, and it was the best I could do under the circumstances.

BLACK LOCUST POISONING OF CHICKENS [1]

By M. F. BARNES

Bureau of Animal Industry, Pennsylvania Department of Agriculture, Harrisburg, Pennsylvania

ABOUT the middle of July, 1920, the Pennsylvania Bureau of Animal Industry received specimens of several chickens from Dr. Charles Oat, of West Chester, with a request for a diagnosis. Upon examination bacteriologically and otherwise nothing characteristic of any known infectious disease of chickens was found. More chickens were sent to the laboratory, with results of examination similar to those of the first lot. The trouble then

[1] Contributions from the Bureau of Animal Industry of the Pennsylvania Department of Agriculture. New Series No. 3.

subsided for a few days, and on July 27 more chickens were found dead.

On July 30 we arranged to visit the premises, and upon arrival the chicken house was seen located on the top of a small hill and surrounded by trees. The lot was on a hillside which sloped to the southwest and was more or less shaded by apple trees under which were fallen apples, some of which were ripe, and many had rotted. The ground was mostly bare, but in parts of the lot there was a variety of weeds, and shrubbery along the fences. The identified weeds were evening primrose, wild aster, catnip, burdock, milkweeds, etc. There was a large black locust tree in one corner of the lot, and in that corner there were numerous young locust sprouts and shrubs.

Upon inquiry with reference to the history, it was learned that about two weeks prior to the date of our visit the caretaker found 12 chickens dead and 8 others lying very sick and unable to move about, apparently paralyzed. The 8 died that day or the next, and new ones were found sick or dead at the rate of 6 to 8 a day for several days. The trouble then subsided for a few days. About three days prior to our visit 11 had died. Up to this date about 50, of a total of 200 to begin with, had died. In addition 3 guinea fowls had died. Some of the sick fowls were confined and given olive oil and recovered. However, not all that were given olive oil recovered.

The feed and water were examined and appeared to be of good quality.

At the time of our visit 6 chickens were sick and the following symptoms were observed: Chickens lie down apparently paralyzed; eyes closed or half closed; comb quite red; feces were thin, slimy, greenish, and contained strings of mucus or mucus and blood. Affected chickens breathed very deeply and heavily, and with a thumping motion.

Before the trouble started there was a total of 200 chickens, and of these 70 to 80 were over 1 year of age. The balance consisted of recently hatched and growing young chickens. All except one of those that had died were from the group over 1 year of age. The younger chickens did not have free access to the same lot in which the older chickens were permitted to run.

Inquiring further into the history, the most striking thing was that only chickens that were permitted to go into the lot described above became sick. If they were shut in the house no

new ones became sick and some of the sick ones recovered. If they were again allowed to go into the lot new ones became sick.

Two affected chickens were autopsied on the farm, and each showed an enteritis and degeneration of the liver and kidneys. One was brought to the laboratory for further bacteriological study, after which nothing that would shed light on the trouble could be reported. The contents of the gizzard were green. When the crop of this chicken was opened it was found to contain 16 leaves similar in shade to black locust leaves. These leaves were collected and the farm was visited and comparison with the black locust leaf and leaves of other plants found in the lot showed them to be the locust leaf. Locust shrubs were then examined, and it was found that the lower branches of many of these were stripped. The chickens were then driven into the corner of the lot containing the locust and were observed for some time. Many of them were seen picking off the leaves.

A bundle of the locust leaves was collected and brought to the laboratory and ground and fed to several chickens, which developed symptoms similar to those seen at the farm and died in 12 to 24 hours. This operation was repeated about three months later, when locust leaves were fed to 6 chickens for a period of one week and none of them showed anything abnormal.

It is claimed by the veterinarian in charge of these chickens that during other years he had met with a similar condition in chickens during the season of the year that these were affected and not at any other time. If that is the case, then in this section of the country the time from July 1 to the middle of August would cover the dangerous season for black locust poisoning in chickens.

NECROBACILLOSIS IN COW AND CALF

By L. R. VAWTER

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THE OCCURRENCE of a fatal case of nodular necrosis of the liver in a dairy cow and fatal infection of the same type occurring in her calf presents a plausible explanation of the origin of this infection in the latter.

The cow, a purebred Jersey of a very hardy type, gave birth to a calf which appeared normal in every respect at birth. Par-

turition was normal and there was no retention of placenta or pathological discharge following parturition.

At two weeks of age the calf developed a severe case of calf scours. A member of this department was called and administered anti-calf-scour serum in large doses, supplemented with caster oil, followed by bismuth subnitrate. The calf died on the day following first clinical observations. Autopsy was made and revealed acute desquamative catarrhal enteritis and bilateral lobular pneumonia associated with fatty degeneration of the liver. The umbilical vessels were normal for a calf of this age, with no evidence of any previous pathological condition in this part. There was no evidence of necrophorus lesions in the cadaver.

The postmortem examination was conducted in the laboratory and a liberal quantity of heart blood was collected aseptically and inoculated directly into aerobic and anaerobic media in liberal amounts. After 48 hours' incubation a moderate growth of *Bacillus necrophorus* and a hemolytic steptococcus appeared in the anaerobic meat media. The necrophorus and steptococcus were isolated in pure culture. The necrophorus culture was inoculated subcutaneously in a rabbit, with the production of a characteristic necrophorus lesion and death of the rabbit. Recovery of the organism was made from the subcutaneous lesion in the rabbit.

Approximately two weeks after the death of the calf a member of this department was called to treat the dam. The clinical symptoms at the time of first observation were sudden cessation of lactation, anorexia, temperature 106, pulse 90, and slightly accelerated respiration. There was moderate constipation with peristalsis inactive. A thorough physical examination failed to demonstrate conclusively the cause for these clinical symptoms. During the month immediately following parturition the animal had been normal in every respect and milk production was high.

The cow was given symptomatic treatment and observed regularly. On the third day symptoms of peritonitis appeared and treatment was adjusted in an attempt to alleviate this condition. Death of the animal occurred on the fifth day of illness.

Postmortem examination revealed nodular necrosis of the liver, fibropurulent peritonitis and fibropurulent pleuritis with adhesion of the right lung to the diaphragm and thoracic wall. The liver was considerably enlarged and presented approximate-

ly 50 multiple encapsulated nodular foci, varying in size from 10 to 30 mm. in diameter. Most of the nodules were firm on cut surface and only occasionally exhibited central liquefaction. The color was yellowish, which changed to red brown after exposure to the air for a few minutes. Many of the nodules on the liver surface had ruptured, thus permitting the infection to be disseminated throughout the peritoneal cavity. Several of the nodular foci in the liver had undergone complete resolution, as evidenced by cicatrical tissue replacement. The duodenum and diaphragm exhibited several necrotic erosions due to contiguity of adjacent liver lesions. Two metastatic necrotic foci approximately 40 mm. in diameter were found in the right lung. No exidence of necrophorus or other pathological lesions could be found in the reproductive organs or the mammary system.

A bacteriological and histological examination was made of the organic lesions. *Bacillus necrophorus* was recovered in pure culture from the nodular necrotic foci of the liver. This was confirmed by rabbit inoculation and cultural study.

Unfortunately no bacteriological study was made of the uterine fluids or the milk of the dam, so in light of this fact it is impossible to determine definitely the exact mode of infection of the offspring. However, the stage of resolution of many of the nodular necrotic areas in the liver points toward the existence of this pathological condition in the liver for an indeterminate period. The metastatic nature of the infection indicates that the necrophorus infection at some time gained entrance to the general circulation. The circulatory necrophorus invasion brings forth two possible modes of infection of the offspring, namely, prenatal by means of uterine infection, and by means of the digestive tract from the ingestion of infected milk following birth. The latter I think is improbable in light of the total absence of necrophorus lesions in the calf at time of death. Particularly do I wish to call attention to the rather unusual septicemic necrophorus infection in the calf.

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ABSTRACTS

REPORT OF INVESTIGATIONS MADE BY THE VETERINARY INSTITUTE OF THE UNIVERSITY OF LEIPSIC. A. Eber. Centbl. Bakt., etc., 1 Abt. orig., Bd. 78, Heft 5, pp. 321-364.

In his report the author draws the following conclusions:

We ask ourselves now after many years of the application of the four main methods of protecting cattle against tuberculosis (bovo-vaccine of von Behring; tauruman of Koch, Schutz, Neufeld & Meissner; antiphymatol of Klimmer; and the reed sacks of Heyman) what they have really accomplished, and on reviewing the several protective procedures we find that the lessening of the spread of tuberculosis has only occurred in a very few cases in which the strictest prophylactic and hygienic measures have been applied simultaneously with the protective treatment. As evidence of this we have only to consider the experiences with bovo-vaccine and with antiphymatol. As we have already stated in the discussion of these products, it is extraordinarily hard in those cases in which prophylactic and hygienic measures have been applied at the same time that protective inoculations have been made to decide which part of the results should be credited to the prophylactic and hygienic measures and how much to the inoculations. Consideration of the material collected by us fails to show that such combination will secure more benefit than the application of prophylactic and hygienic measures alone.

Great hardships are also encountered when one tries to estimate the benefit derived from the use of Heyman's reed sacks and Klimmer's antiphymatol as treating agents upon herds in which tuberculosis is already present. We have thoroughly studied this question in its relation to Heyman's protective treatment and in the foregoing report have frequently expressed our opinion in regard to it.

It can not be denied that the annual inoculation of heavily infected herds with certain preparations, especially Heyman's reed sacks, will produce a reduction in the amount of tuberculosis in the herd which at first glance must be ascribed to the healing effect upon the tuberculous processes of the material injected, but these results can not be expected in all cases. They fail completely at times without apparent reason, and in a very

few cases they lead to the healing of the treated animal so that in changing the value of the protective treatment the wider spreading of the tuberculous processes in a few animals and the appearance of open forms of tuberculosis in others, in spite of their protective inoculations, must be taken into account. We must also recognize here the danger of the sudden appearance of creeping forms of udder tuberculosis which we have seen develop three times after the use of Heyman's reed sacks, all of these in slightly infected herds, and once this condition has appeared after the use of antiphymatol, which makes it certain that the healing powers of protective inoculations against tuberculosis is not a factor that needs to be reckoned with in the struggle to eradicate tuberculosis.

Our final conclusions regarding the practical importance of the protective inoculation methods that have been recommended for use in the fight against tuberculosis are that none of these products are able to give cattle lasting protection against natural infection with tuberculosis. Further, the experiences which we have gathered in our practice fail to show that these products applied, together with prophylactic and hygienic measures, produce any more benefits than the consequent use of these prophylactic and hygienic measures alone.

H. J. WASHBURN.

THE ADSORPTION OF APHTHOUS VIRUS. H. Vallee and H. Carre. Compt. Rend. Acad. Sci. Paris, 1921, 172, pp. 185-186.

Previous researches have shown that the filtrable viruses of infectious anemia of the horse and canine distemper can be adsorbed by small particles in suspension. A continuation of these studies has shown that foot-and-mouth virus is similarly adsorbed.

If to the filtrate obtained by filtering a suspension of aphthous epithelium in physiological salt solution through a Chamberland filter, there is added a quantity of washed bovine red blood cells, with agitation, there is abundant fixation of the virus.

When washed in salt solution and centrifuged several times the red cells conserve their virulence. Injected subcutaneously in bovidae, the red cells cause the aphthous fever in its classical form. It is to be expected that the virus thus fixed upon formed elements may, under certain conditions, undergo phagocytosis. Although slowly phagocytised when fresh, the washed red cells

are rapidly ingested when first killed by keeping for 48 hours at 2° C. (36° F.). In this latter condition, when charged with virus by the above method, they produce the aphthous condition when subcutaneously injected even in small doses. The disease is not produced on intravenous injection of much larger doses.

Similarly, killed bacteria, sensitized by immersion in specific serum, which renders them easily phagocytised, can adsorb the virus. Such sensitized bacteria, charged with virus, can be injected intravenously without producing the disease; it is produced on subcutaneous injection. However, if overwhelming doses are used the disease results whatever the method of injection.

The injection results in a febrile reaction with or without aphthous symptoms, according to whether the dose is followed by incomplete or complete phagocytosis of the virus adsorbed. A single injection of adsorbed virus under these conditions does not immunize animals. This confirms the previous findings of Nocard and Roux; of the necessity of the development of ulcers before appreciable antiaphthous immunity is induced.

These results indicate that red cells may contain a virus without revealing it microscopically. Phagocytable suspensions of various filtrable viruses can thus be obtained and used for immunity studies. The method permits the preparation of sensitized viruses. W. N. BERG.

ETIOLOGY OF MENINGO-ENCEPHALITIS EPIZOOTICA (BORNA DISEASE). R. Kraus. Zeitschr. f. Immunitatsforsch. u. Exper. Ther., Part 1, Orig. Vol. 30 (1920), No. 2, p. 121.

A disease of horses manifested by characteristic cerebral symptoms, which has occurred from time to time in Argentina for a number of years, has been recognized for a long time as Borna disease (the European malady). For certain diagnosis of the disease the author considers the demonstration of the peculiar brain lesions of prime importance. These changes are made not only in histological preparations and consist in an acute, disseminated, infiltrative, *non-purulent* meningo-encephalitis of lymphocytic type. These findings agree with those described by Joest and Deegen, who made a careful and thorough study of the European disease. Practically no other pathologic changes are found.

From the brains of horses affected with the disease Kraus isolated a diplococcus with which he was able to reproduce the

malady in other horses quite regularly by subdural inoculation. Such experimental cases showed typical clinical symptoms and the characteristic histological changes in the brain. Control horses inoculated with cultures of meningococci and *B. coli* showed different clinical symptoms than those infected with the diplococcus, and the anatomic brain findings were decidedly different. Other methods of inoculation gave uncertain results. In goats, sheep and calves the disease was produced by cerebral inoculation of pure cultures of the diplococcus. In rabbits and guinea-pigs not only subdural but also intravenous and subcutaneous injections were successful.

L. T. GILTNER.

PARATYPHOID INFECTION IN SWINE RESULTING FROM CONTACT WITH PARATYPHOID SICK CALVES. Schermer and Ehrlich. Deut. Tierartzl. Wchnschr., 1920, No. 46. Abst. in Deut. Schlacht u. Viehhof Zeit., 1920, No. 47, p. 432.

On a certain farm all the pigs and calves ranging in age from two to three weeks were taken sick; four calves and about thirty pigs died, while older pigs were not affected. Bacteriologic examination of one of the dead pigs revealed the presence of bacteria of the Gartner typhoid group in all the organs. In the blood of one of the calves that had been sick, there were demonstrated paratyphoid B agglutinins. A further study showed that both the pigs and calves had the same infection.

The above case shows the possibility of the frequent occurrence of paratyphoid infection in domestic animals, particularly in the young, and that the infection may be interchangeable from one species to another.

L. T. GILTNER.

STALLIONS CLINICALLY RECOVERED FROM DOURINE MAY REMAIN (APPARENTLY) HEALTHY CARRIERS OF THE PATHOGENIC ORGANISMS. Edm. Sergent, A. Donatien and A. Lheritier. Bul. Soc. Path. Exot., vol 13 (1920), no. 7. Abst. in Trop. Vet. Bul., vol. 8 (1920), no. 4.

During the course of the war a striking recrudesence of dourine occurred in Algeria, and the above workers from the Pasteur Institute of Algiers were called upon to undertake researches upon the methods of diagnosis and treatment of this disease. Affected stallions were handed over to the Institute by the military authorities, and experiments were made in order

to ascertain whether clinical recoveries could be confirmed by laboratory methods.

Microscopic examination of the blood of affected or recovered animals invariably showed no trypanosomes and thus recourse was had to the inoculation of large quantities of blood into a very susceptible animal such as a dog. A medium sized dog would thus receive intraperitoneally about 200 c.c. of blood.

Stallions were chosen which had shown dourine lesions and had then been treated with a suitable remedy (atoxyl and orpiment according to Monod's method). After regaining apparently all the signs of complete health these animals were tested periodically over a period of three years by extracting from each about 400 c.c. of blood at a time and this was inoculated into two dogs. The blood of each dog was afterward examined three times a week for at least a year. Data are given concerning four stallions and these are summarized as follows:

No. 1. During the month following complete clinical recovery its blood still infected two dogs. Subsequently 3½ liters of blood were inoculated during three years into 19 dogs, but no infection took place.

No. 2. After a double treatment the animal seemed to have made a complete clinical recovery. Over a period of a year 8 dogs received 1½ liters of blood but were not affected. Fourteen months after the apparent recovery 1 out of 2 dogs became infected with the blood. Subsequently over a period of 2 years, a total quantity of 2 liters failed to infect 10 dogs.

No. 3. After treatment this animal seemed to present a complete recovery for a period of 2 years and was placed on active service with a cavalry regiment. About 2,200 c.c. of blood taken during these 2 years did not infect 11 dogs. When tested again after this period of recovery the blood was found to be once more capable of infecting a dog.

No. 4. After 3 years and 3 months of complete recovery, during which time 3,640 c.c. of blood failed to infect in all 19 dogs, the blood again became infective for 1 dog out of 2.

It would therefore appear from these observations that horses cured completely of dourine from a clinical point of view, kept at active work and showing no trypanosomes in their blood even when tested by inoculation of several liters, suddenly gave evidence of the presence of the organisms in their peripheral blood after intervals of 14 months, 2 years, and 3 years and 3 months.

A stallion that has been affected with dourine may thus remain a source of danger even when it has seemingly made a perfect clinical recovery.

Consequently all stallions that have been affected with dourine ought to be excluded from service at the stud. If the animal is in low condition it ought to be slaughtered. If, as the result of a suitable treatment, it regains apparent good health it ought to be castrated and it then may be capable of doing active work.

H. W. SCHOENING.

EXPERIMENTAL DIAGNOSES OF DOURINE. Edm. Sergent, A. Donatien and A. Lheritier. Bul. Soc. Path. Exot., vol. 13 (1920), no. 7. Abst. in Trop. Vet. Bul., vol. 8 (1920), no. 4.

Microscopic examination of the blood of horses affected with actively progressing dourine never revealed any trypanosomes. Microscopic examination of serous fluid from the characteristic plaques from two typical cases, together with inoculation into mice and guinea-pigs likewise failed to show the organisms. The best method of demonstrating the organism is to inoculate large quantities of blood intraperitoneally into the dog. It is estimated that Arab and Barb horses kept at the Algerian studs contain each about 20 to 25 liters of blood. If 400 c.c. is taken for inoculation from 1/50 to 1/60th of the total blood capacity is used for the test. This method enabled the authors to detect persistent infection in horses that were apparently quite recovered. On the other hand, even when used in such high doses blood inoculations in certain cases failed to enable them to isolate the trypanosome from horses that presented a characteristic and complete clinical picture of dourine.

One stallion presented plaques and other characteristic lesions which indicated a relapse occurring over a year after the completion of medical treatment. Its blood, however, showed no signs of being infective for dogs (3½ liters inoculated into 19 dogs in all). A second affected stallion failed to infect 2 dogs with 400 c. c. of blood at the second month of the disease, i.e., during the acute stage when it presented plaques. However, a dog became infected with 160 c.c. at the sixth month.

Two more stallions showed all the characteristic lesions of severe dourine, to which they both succumbed with typical symptoms in four months. The blood of one of these horses proved infective for a rabbit after the disease had been in progress one month, but it gave negative results when inoculated into dogs

on the second and third months (with 800 c.c.). The blood of the second horse was not infective for dogs on the second and fourth months (700 c.c.).

It would therefore appear the *Trypanosoma equiperdum* is sometimes so rare in the general circulation of horses showing all the typical characters of very severe dourine (notably typical plaques) that an inoculation of susceptible animals with a quantity of blood equivalent to 1/50th or 1/60th of the total blood volume remains without result. The only results that are of any value for diagnostic purposes are, therefore, the positive ones when they are obtained. H. W. SCHOENING.

A CASE OF HUMAN GLANDERS. F. H. Jacob, H. M. Turnbull, J. A. Arkwright and G. M. Dobrashian. The Lancet, London, Nov. 6, 1920, p. 941. (Abst. in Jour. Amer. Med. Assoc. Dec. 4, 1920, vol. 75, no. 23, p. 1597.)

The patient, a man, aged 31, was a farmer. He attributed the origin of his complaint to infection from the diseased udder of a cow. The udder of this cow was affected with a series of small lumps, which broke and "discharged water and matter." The man who previously milked the cow had a few spots on his arm, said to have been exactly the same as those from which the patient suffered. The patient then took over the milking of the cow; the original milker got quite well, but he himself became infected. The primary lesion was an ulcer which reached the size of about half-a-dollar, discharged a great deal of pus, and took about three weeks to heal. Lesions appeared later on the tonsil, soft and hard palate, buccal surface of cheek, and around some teeth, uvula, eyelids, conjunctivæ, in the glands, in the neck and elsewhere. The histologic picture was that of an intense, acute, vascular and perivascular hemorrhagic necrosis with fibrinous exudation and purulent infiltration. The appearances suggest bacterial embolism, but with the exception of one Gram-positive bacillus in a section stained by the Weigert-Gram method, and one bacillus in a section stained with Twort's mixture, the four methods for the demonstration of organisms proved negative. Numerous spirochetes were stained brightly in the portion of syphilitic liver employed as a control to Levaditi's method. Treatment was without effect. The patient died from a terminal bronchopneumonia.

[The suggested transmission of glanders from the bovine to man is quite novel, to say the least. We have observed a somewhat similar

condition in a farmer, whose physician believed he had contracted glanders from one of his mules. The complement-fixation test was negative for glanders but positive for syphilis and the patient apparently recovered under treatment with 666.—EDITOR.]

REVIEW

INFECTION UND IMMUNITAT. By Dr. M. Loewit, Professor of General and Experimental Pathology, University of Innsbruck. One volume of 550 pages, with 33 text figures and 2 colored plates. Urban and Schwarzenberg, Berlin, 1921.

Among the books reaching this office there has recently appeared a posthumous work entitled "Infection and Immunity," from the pen of the late Dr. Moriz Loewit, Professor of General and Experimental Pathology in the University of Innsbruck. The several chapters were completed during Loewit's thirty years' activity as an instructor in pathology and were used by him as the foundation of the lectures before his classes. These essays had been rewritten in proper form for a text-book before the outbreak of the World War, and a few chapters had appeared from the press, when the cessation of all activities not directly concerned with the promotion of military matters brought the production of the book to a complete standstill. After the signing of the Armistice and the death of Prof. Loewit, one of his co-workers at the university, Dr. Gustav Bayer, undertook the revision and completion of the book, which task he accomplished with admirable results.

Beginning with a general description of disease, the writer passes on to a discussion of constitutional tendency to the inheritance of disease, and then applies Mendel's law of inheritance to an estimation of the chances which exist for the transmission of disease from an affected parent to its offspring.

Infectious diseases very properly are given careful study. The various causes of infection, such as bacteria, fungi, protozoa, trypanosomes, and their manner of attacking healthy hosts are well described. Following this, attention is called to natural immunity, as seen for instance in the natural resistance of the fowl to tetanus and of the frog to anthrax. The course of reasoning which followed the observation of these natural phenomena, and led to Metchnikoff's phagocytosis, and Ehrlich's side-chain theories, with the establishment of artificial methods of

producing immunity, are outlined in a very interesting and instructive manner. The desirability of fully understanding the development of harmful toxins and of protective antitoxins within the animal economy is fully recognized, and opsonins, complements, amboceptors, antigens and the like receive their full share of attention in consequence.

The complex changes seen in hemolysis and bacteriolysis, and theories of the causes of these marked alterations, together with their bearing on the intricate reactions seen in complement-fixation tests, or in the inhibitions which prevent fixation, are presented in a manner which discloses the enthusiastic teacher who will spare himself no effort to present the principles of his subject in a manner that may readily be grasped by the students.

More space is perhaps devoted to the discussion of anaphylaxis than would have been given had the book been written after the war rather than previous to it, since the experience of military surgeons in the field opposed many theories that had been fully accepted a few years earlier. However, the relation of anaphylaxis to allergy and hypersusceptibility is carefully studied, and the pages relating to these subjects, like those of the other chapters of the book, are well worth diligent perusal.

A valuable feature of the work is an extensive bibliography which appears appended to each chapter, and affords both incentive and guidance to any who may wish to make an exhaustive study of this subject. H. J. W.

A very interesting report of the New York State Veterinary College at Cornell University for 1919-1920 has just been published as Legislative Document (1921) No. 8.

The report contains the annual statement of the Director of the Veterinary College and an appendix which includes records of clinics and research work. There is a total of 238 pages in the document, with numerous appropriate illustrations.

Among the important subjects investigated are diseases of breeding cattle, acute indigestion in ruminants, infectious enteritis in cats, coccidiosis in cattle, pneumonia of swine, carcinoma of domesticated animals, cloacitis in poultry, hog cholera, and treatment of sidebone by shoeing.

A report of this character really becomes a reference book for the profession and measurably extends the limits of veterinary knowledge.

ARMY VETERINARY SERVICE

To the Editor:

1. Enclosed is a copy of Army Regulations No. 605-20, governing the appointment of commissioned officers in the Veterinary Corps, Regular Army.

2. These regulations[1] are not available for general distribution, but copy is being sent you for such use as you may desire to make of it in connection with the publication of the A. V. M. A. Journal.

3. There are at present 14 vacancies in the Veterinary Corps, Regular Army, but authority to hold examinations to fill these vacancies is withheld pending the action of Congress in the coming Appropriation Bill. The retention of the reserve officers on active duty who are temporarily filling the 14 vacancies is threatened after July depending entirely on the provisions of the Army Appropriation Bill when it shall finally pass Congress.

4. Now that the regulations governing appointments to the Corps have been published, it is earnestly hoped authority will be granted to hold examinations with a view to filling the 14 vacancies. This matter will be announced at the earliest possible date.

C. F. Morse,
Lt. Colonel Medical Corps, Director Veterinary Corps.

BELGIAN ARMY VETERINARY SERVICE GIVEN CONTROL OF REMOUNTS

The Belgian Ministry of War has now handed over complete control of remounts to the Army Veterinary Service, according to an item in *The Veterinary Record* quoted from the French *Semaine Vétérinaire*. Previously this control was exercised by a general cavalry officer. The veterinary service is thus charged with all matters connected with officers' remounts; the location of, demands, and changes in horses; purchase of horses for the army and police; measures for the preservation in health of young horses, their development and their preservation for army needs; determination of date of purchase, districts, inspection, and average prices given for the different types of

[1] The regulations consist of ten printed pages and contain information on the law governing appoinments, the general plan for filling vacancies, eligibility, form of application, preliminary, physical and professional examinations, selection and finally appointment.—Editor.

horses presented for sale; distribution among the larger units, according to their needs of mature horses; authority for the distribution of horses gratuitously to officers; rules for casting horses and sale of mares.

This causes the French journal to utter a bitter wail regarding the lack of authority accorded to officers of the veterinary service in the French army.

OUR ENTERPRISING HORSE DEALERS

British army veterinarians engaged in the purchase of American horses during the war discovered that not all American horse dealers are free from guile. It seems that some of these enterprising dealers had a practice of pushing rubber balls, sponges and other articles up the nostrils of "roaring" horses so as to silence the roaring.

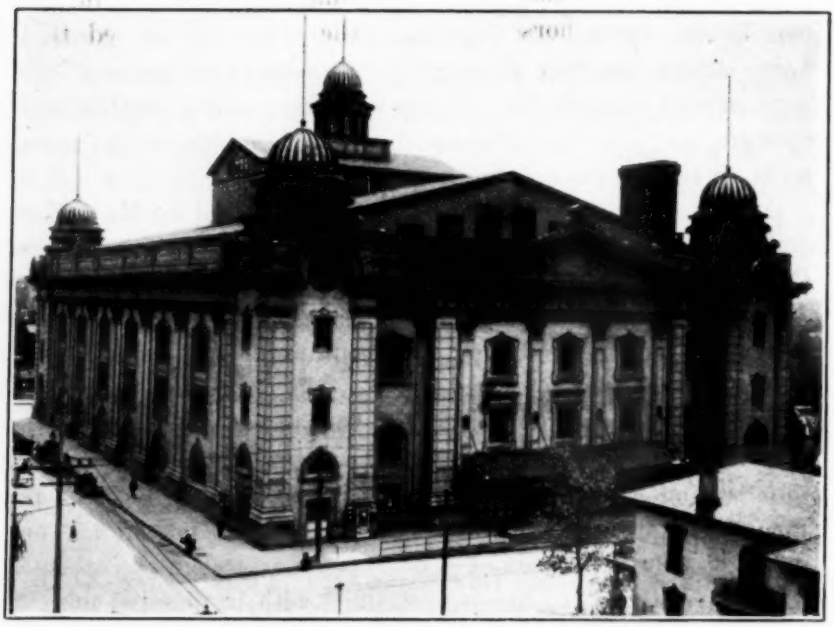
A case of this kind was reported and exhibited by Major Lake and Lieutenant-Colonel Olver at a recent meeting of the British Central Veterinary Society, according to *The Veterinary Record*. A horse which had been bought in America more than two years previously was operated on, by trephining and irrigation, for a fetid discharge from one nostril. No improvement followed and the animal was destroyed. Postmortem disclosed "on either side of the septum nasi, between the anterior and posterior turbinated bones, an India-rubber ball rather larger than the pattern used for playing 'ping-pong.'" In one nostril the only result was the formation of a small polypus, but in the other the turbinated bones had become solidified with inspissated pus. So far as concealing the defect of roaring was concerned, however, the rubber balls had been effective, as neither the officer who rode the horse nor any of the stablemen had ever noticed anything wrong with the animal's wind.

Colonel Olver also stated that he had seen three collapsed rubber balls which had been removed from another horse's nostril, where they had been pushed up one behind another. Evidently such tricks did not always escape detection until after the purchase of the horse, for Colonel Olver exhibited photographs of sponges which he had removed from horses' nostrils at a remount depot in America. His experiences seem to have abundantly justified his remark that "there was a certain class of dealer in America who were pastmasters in the art of 'faking' horses for sale."

ASSOCIATION NEWS

KEEP IN MIND THE DENVER MEETING

Take your calendar and draw a red line around the dates September 5 to 9. That is the time for the fifty-eighth annual meeting of the American Veterinary Medical Association. The convention itself and the delights of Colorado form a double attraction that will be hard to resist. Don't try to resist.



Auditorium at Denver where the next meeting of the American Veterinary Medical Association will be held September 5-9, 1921. This building covers half a block and is large enough for the National political conventions.

The sessions will be held in the great Auditorium, a place well suited to accommodate large gatherings. It has stood the strain of a Democratic National convention and other notable assemblies, and there is every reason to believe that it will prove adequate for the A. V. M. A. convention.

A. V. M. A. REPORTS FOR SALE

The Secretary's office has for sale a number of bound volumes of the annual proceedings up to and including the anniversary year 1913. The price fixed by the Executive Board is 25 cents

a volume f. o. b. Chicago. These reports include all the papers presented at the annual meetings as well as the business sessions and will be a valuable acquisition to any veterinary library. Send in your orders promptly.

The Secretary's office also has on hand a few A. V. M. A. Directories of A. V. M. A. members for sale at $2.50 each. This directory contains the names and addresses of over four thousand of the leading veterinarians of America.

N. S. MAYO,
4753 Ravenswood Ave., Chicago, Ill.

PHILADELPHIA VETERINARY CLUB

The Philadelphia Veterinary Club held its regular monthly meeting Tuesday evening, March 29, at the Veterinary School, University of Pennsylvania.

Mr. Rutherford, of the S. P. C. A., gave a short talk on the help given by the veterinarians and their cooperation with the society. Mr. Rutherford brought with him Isadore Blum, aged 12 years, to whom had been given a $25 prize by the society for writing an essay entitled "The care and treatment of horses and cattle, especially the overchecking of driving and draft horses," which paper he read at our meeting.

Dr. Herbert Fox, Medical Department, University of Pennsylvania, discussed the diseases of the blood of mammals and birds in a very interesting manner.

The subject of equine pneumonia was brought up at the meeting and called forth a lengthy discussion. Some very interesting points were developed by Drs. Marshall, Cox, Schneider, Klein, Kimball, Lee, Ivens, Eves, Boerner and Lentz.

There were forty-two in attendance. The entire meeting was a very interesting one.

C. S. ROCKWELL, *Secretary.*

TUBERCULOSIS CONFERENCE AT ATLANTA

A tuberculosis eradication conference, consisting of State and Federal employes engaged in cooperative tuberculosis eradication work and veterinary practitioners in the States of Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia, was held in the Convention Hall of Piedmont Hotel,

Atlanta, Ga., on May 2-4, 1921. A most interesting program was carried out, including twenty papers, numerous discussions, tuberculin tests and postmortem demonstrations on tuberculin reactors.

PHILIPPINE VETERINARY MEDICAL ASSOCIATION

The ninth annual meeting of the Philippine Veterinary Medical Association was held in the ampitheater of the College of Medicine and Surgery, Manila, on February 4 and 5, 1921.

On February 4 the meeting was called to order, Dr. Vicente Ferriols presiding.

Dr. Buencamino presented as the first speaker Governor Carpenter, whose topic was "An Informal Truth Talk." He pointed out what in his opinion were the grave mistakes incurred by the veterinarians in the field and cited personal experiences in Mindanao and the provinces around Manila. He said the veterinary profession in the Philippine Islands has great potentialities. He emphasized the necessity of devoting more attention to veterinary "eugenics" as he said since the veterinary profession in the Philippines could not offer any cure or preventive treatment for rinderpest it is very imperative that we should endeavor to produce a Philippine type of animal which will be resistant to disease in the same manner that the medical profession is endeavoring to produce a type of man who is physically resistant to disease.

Questions were asked by some members of the association, which were willingly answered by the Governor.

As the hour was getting late, Dr. San Agustin moved to dispense with the reading of the minutes by the secretary, which was carried.

The Executive Commitee presented the names of Doctors Ashcraft, Koster, Morales and Vytiaco for active membership and those of Doctors Moore, Crocker and Schwartz for honorary membership, and they were approved.

The Committee on Diseases presented a good survey of the diseases prevalent in the different parts of the Islands. This report was read by Dr. Villa in the absence of the Chairman, Dr. Kern.

The Committee on Resolutions presented a resolution the subject matter of which was the appointment of a permanent Dean

for the College of Veterinary Science. Dr. Rotea moved to adopt the resolution and it was approved.

The Finance Committee reported on the financial standing of the association, showing that there is much to be improved in this respect.

An amendment to the Constitution was presented by the Secretary signed by the Executive Committee combining the functions of the Secretary and the Treasurer in the position of Secretary-Treasurer, which was carried.

At the afternoon session Dr. Shealy read a well written paper on "The Position that Veterinary Science Occupies with Relation to Animal Industry." A good chart was also shown.

Dr. Ashcraft read a good paper on the subject of "Antiseptics in Surgery."

The last speaker of the afternoon was Dr. Koster, who spoke on "My Experiences as a Veterinarian in the A. E. F." He gave a good story of his experiences in France during the war and the veterinary problems with which the A. E. F. had to cope and the happy manner in which these problems were solved. He said that mange and glanders were the two most important diseases they had to handle in the veterinary hospitals in France. The test used for glanders was generally the intrapalpebral and for mange the most effective measure was the dip, made of 8 parts of lime, 22 of sulphur and 40 of water, boiled for 2 hours and kept at the same volume until a chocolate brown color appeared. The scum was discarded and the mixture was diluted to 5 or 6 times its volume. The solution was placed in the dipping vat and used several times until it was so dirty that it was no longer convenient to use.

The free-for-all talks were entered into by all the members of the association, and good and instructive discussions were heard from everybody.

On the following morning Dr. Youngberg was the first speaker. He spoke on "The Future of the Veterinary Profession in the Philippines." He said that it is high time that we should think of providing for the activities of the Government veterinarians in other branches of the work. If so far the work of the Veterinary Division has been in rinderpest work, it is due to lack of sufficient graduates in our profession. The time will come when at least each province will have its veterinarian who would cope with all the problems pertaining to the animal in-

dustry within its boundary. He also showed that the facilities in the Veterinary Research Laboratory at Pandacan are becoming inadequate for the big work which is rapidly increasing. There must be a coordinated system of work between the Veterinary Division and the Division of Animal Husbandry of the Bureau and this should be included within the scope of a Bureau of Animal Industry something analogous to the one at Washington, D. C.

The next speaker was Dr. San Agustin, who read a well written paper on "Barley for Fattening Hogs." He described a scientific experiment performed in Wisconsin while the author was taking graduate work in feeding in the United States. It was found that barley and whey gave the highest and most economical feeding value for swine ever found in the United States. He pointed out the necessity of conducting analogous experiments with our native feed. He also stated that the Berkshire pig which meets with general favor in the Philippines is losing popularity in the States in that it is a slow breeder and a poor mother. He said that the Poland-China is now taking the lead in the States and that the animal husbandry work along swine production in the Islands should be directed towards the introduction of the Poland-China breed.

Dr. Gomez spoke on "The Curriculum of the Veterinary College." He showed the evolutionary changes through which it had gone and the revision of the same so as to adapt it to the requirements of the present time and the existing conditions at Los Banos.

Dr. Boynton spoke afterwards on "Anaplasmosis Marginale" among the native cattle.

The election of new officers was conducted during the banquet at the Hotel Mignon. The following officers were elected: President, Dr. Vicente Ferriols; Vice-President, Dr. Harry F. Kern; Secretary-Treasurer, Dr. Angel K. Gomez.

A. K. GOMEZ, *Secretary.*

SOUTHEASTERN MICHIGAN VETERINARY MEDICAL ASSOCIATION

For the second time in two years it has been the unusual privilege for the same group of veterinarians to gather together for the purpose of celebrating the golden anniversary of the graduation of one of their colleagues into the veterinary profes-

sion. Our association thus honored Dr. Joseph Hawkins, at the Hotel Fort Shelby, Detroit, April 13, 1921, one year after they had paid a similar tribute to Dr. David Cumming, at Port Huron, Michigan.

Dr. Hawkins graduated from the Ontario Veterinary College, with the class of 1871. Of his fifty years of active service, forty-three have been spent in Detroit. He was the first agent of the Bureau of Animal Industry appointed at Detroit, in the late eighties. His inspection work took him pretty well over the State, all shipments of livestock to and from Canada calling for his services.

Association work has always received more than a fair share of Dr. Hawkins' time. He was an organizer of the Michigan State Veterinary Medical Association, in 1883, and served as the first president of the organization. He is a member of the American Veterinary Medical Association and takes a very active part in the meetings of the Southeastern Michigan Veterinary Medical Association. These facts and many of the good traits of Dr. Hawkins were brought out in the speeches made following the banquet. The whole affair was so managed as to be a complete surprise for the honored guest.

The toastmaster called upon sixteen of those present to pay tribute to Dr. Hawkins. Some of these men had known him only a few years, some for a score of years, three for over two score, and one—Dr. Cumming, who had been a senior at college when Dr. Hawkins was a junior—for fifty-two years. Each recalled some incident of his acquaintance, and several good laughs were had at Dr. Hawkins' expense.

Letters were read from a large number who were unable to be present. A telegram from Dr. W. Horace Hoskins, of New York City, was one of the many pleasant incidents that marked the evening. It was as follows:

"To my distinguished colleague: Long and faithful years of honored service have been vouchsafed to your community and State, and our nation's welfare has been conserved by your years of faithful performance of the duties of your profession. In this golden anniversary your Alma Mater is honored. Your colleagues rejoice in the privilege of paying this justly earned tribute. As the evening shadows hover over your splendid life may peace of mind, bodily and spiritual comfort be yours, and may you be spared from physical pain is the wish and prayer of Dean Hoskins."

As a little remembrance of the occasion, Dr. Hawkins was given a silk umbrella, the toastmaster calling upon Dr. Robert H. Wilson to make the presentation. Roll-call showed 26 veterinarians present, and it is interesting to note that there were nine present whose combined years in the profession numbered 361, an average of over 40 years per man.

Among those who paid their respects to Dr. Hawkins were Geo. W. Dunphy, State Veterinarian of Michigan; S. Brenton, charter member and first treasurer of the Michigan State Veterinary Medical Association; John V. Newton, of Toledo, Ohio; E. P. Schaffter, B. A. I. Inspector in Charge, at Detroit; Judson Black, Secretary of the State Examining Board; F. W. Chamberlain, Acting Dean, Veterinary Division Michigan Agricultural College, East Lansing; H. H. Sparhawk, Board of Health, Detroit; J. W. Brodie, Pontiac; James J. Joy, Detroit; Geo. D. Gibson, Adrian; H. T. Carpenter, Detroit, and T. F. Krey, Detroit.

Officers of the association, elected at the January meeting, are: President, H. T. Carpenter, Detroit; Vice-President (Wayne County), Dr. H. Cornehl, Detroit; (Oakland County), Dr. J. W. Brodie, Pontiac; (Macomb County), Dr. Judson Black, Richmond; Secretary-Treasurer, H. Preston Hoskins, Detroit.

The association decided to hold the summer meetings in the form of a picnic on July 13, at Northville.

H. PRESTON HOSKINS, *Secretary.*

BRITISH COLUMBIA VETERINARY ASSOCIATION

A joint meeting of the British Columbia, Wasington, Oregon and Idaho Associations, has been arranged to take place in Seattle, Wash., at the Hotel Butler on July 14 and 15, 1921.

Last summer this association had a very successful one-day meeting in Bellingham, Wash., with the Washington association, there being 28 veterinarians present, about an equal number from each. At that time the idea of joining them at their annual meeting this year was suggested, and now the Oregon and Idaho association members are also coming. So you will see we are bound to have one of the best veterinary meetings ever held in the West.

A good program is being arranged and if there is any subject you would like to hear discussed, I will be glad to try and arrange it with the other associations.

We hope all members and their friends will try and arrange to take a vacation and come to a meeting which will be both pleasant and profitable. We would like to see the profession well represented and so far I have received a good response.

KENNETH CHESTER, *Secretary.*

WASHINGTON STATE VETERINARY MEDICAL ASSOCIATION

The next meeting of the Washington State Veterinary Medical Association will be held July 14 and 15 at the Butler Hotel, Seattle, Washington. It will be a oint meeting of the Oregon, Washington and British Columbia Associations. The Idaho Association is being urged to join in and is expected to cooperate. Eastern veterinarians are cordially invited to be present.

CARL COZIER, *Secretary.*

VETERINARY LABORATORY FOR SOUTH DAKOTA

A substantial two-story building of brick and hollow tile, with a one-story wing containing two rooms for small experimental animals, a postmortem room and a supply room, now houses the animal health laboratory and department of veterinary science and bacteriology at South Dakota State College. Dr. C. C. Lipp and his staff are now settled in the new building which is just to the west of the college armory.

The first floor of the building contains two well-equipped laboratories with all the apparatus usually found in such places and also several offices conveniently located for the animal health laboratory staff. The second floor contains a classroom and several storage rooms.

The entire building, heated by steam and supplied with sewer and water connections, is splendidly lighted by both natural and electric light. The laboratories contain many built-in features not usually found in smaller institutions. Latest electrical devices are used to save time and increase efficiency. Many of these are of the self-regulating type and when properly adjusted will operate continuously without further attention.

The new building and equipment enable the department to give more and better service to the veterinarians and livestock men of the State.

NECROLOGY

As we are going to press the sad news is received of the death of Dr. James Law, at Springfield, Massachusetts, on the night of May 10.

Dr. Law was born in the County of Edinburgh, Scotland, February 13, 1838. His early education was obtained in private and parish schools of West Calder and Livingston, later in the Burgh High School of Dunbar, East Lothian. At the age of 16 he entered Edinburgh Veterinary College and graduated in 1857. Though the youngest member of the largest class which up to that time had graduated from this institution, he was awarded the medal for the best examination in anatomy and shared equally with Dr. William Williams the honor of passing the best general examination. In 1863 the Royal College of Veterinary Surgeons conferred upon him the degree of M. R. C. V. S.; in 1870 he became F. R. C. V. S. The year following his graduation, Dr. Law accepted the position of Demonstrator of Anatomy in his Alma Mater and later taught Materia Medica (1860-65). In 1865 the college was transferred to London and he became Professor of Anatomy.

In 1868 Dr. Law accepted the chair of Veterinary Science in Cornell University, Ithaca, New York, which he held until 1896, when he was appointed Director of the New York State Veterinary College which that year was founded and endowed as a College of the University. Here he taught the subjects of veterinary medicine, veterinary science and parasites and parasitisms in domestic animals from 1896 to 1908, when he retired after forty years of service at Cornell.

As a teacher and writer Dr. Law was most eminent among those who have contributed to the development of veterinary education in this country. His appreciation of the high purposes of veterinary medicine and his keen foresight are indicated by his attitude toward higher veterinary education. Cornell, at a comparatively early date, prescribed a four-year high school course or its equivalent as one of the entrance requirements.

During his American career Dr. Law was veterinary editor for the New York *Tribune, Livestock Journal,* and contributed liberally to various other journals, magazines and standard medical works on veterinary subjects. The most important of his

productions as an author are "General and Descriptive Anatomy of Domestic Animals," "Farmers' Veterinary Adviser" and the "Text Book of Veterinary Medicine," consisting of five volumes.

He was consulting veterinarian to the New York State Agricultural Society from 1868 to 1896, chairman of the U. S. Treasury Cattle Commission appointed in 1880, and a member of the New York State Commission on Tuberculosis in Cattle. He assumed charge of contagious pleuro-pneumonia eradication work on behalf of the B. A. I. in Illinois on April 20, 1887, and in New York on December 1, 1887. In 1880 he represented the U. S. Department of Agriculture at the International Veterinary Congress at Brussels, Belgium, and during the outbreaks of foot-and-mouth disease in 1902, 1908 and 1914 he rendered assistance through his advice to national and State authorities.

Dr. Law was a great champion of higher veterinary education and he was regarded as one of the foremost veterinary educators in America. In his studies he explored every avenue of learning and with tireless brain he wrought to elevate his profession and promote the livestock industry. He was always a conspicuous figure in his profession through his teachings and literary contributions. He was a thorough gentleman, loved by all who had the pleasure of knowing him. He is survived by his widow, to whom he had been married for 58 years, and by three daughters.

Dr. John Edward Clark died in Washington, D. C., on May 4 of an acute attack of Bright's disease and was buried at Annapolis, Md. Dr. Clark was born in Raleigh, N. C., 27 years ago. He moved to Maryland as a young man and was employed by the Baltimore branch of Parke, Davis & Company for the four years prior to entering the Veterinary College of George Washington University in 1916. When the latter college closed its doors during the war, he was transferred to the Veterinary School of the University of Pennsylvania from which he graduated in 1920. He became a member of the A. V. M. A. at the Columbus convention. At the time of his death he was an assistant to Dr. D. E. Buckingham in whose practice he showed much promise and was developing as a clever operator. He made friends easily and carried high ideals regarding the profession. During the war he was appointed a sergeant in the Students' Army Training Corps. Dr. Clark leaves a widowed mother, one brother, and a host of friends.

MISCELLANEOUS

VINEGAR AN EFFICIENT GERMICIDE FOR THE NECROSIS BACILLUS

Several months ago a veterinary officer at one of the Army remount depots reported that he had had uniformly good results in the treatment of gangrenous dermatitis due to the necrosis bacillus (*Bacillus necrophorus*) by using foot baths of dilute cider vinegar. This led to some experimental tests, which were conducted by Captain Raymond A. Kelser in the Army Veterinary Laboratory which then occupied quarters in the Veterinary School building. Liquor cresolis comp., carbolic acid and bichloride of mercury were tested in comparison with commercial cider vinegar and it was found that the vinegar exerted a stronger germicidal action on the *Bacillus necrophorus* than any of the other substances. Liquor cresolis comp. was second in efficiency. Commercial cider vinegar was found to have an acidity of approximately 5½ per cent and to retain its germicidal action against *Bacillus necrophorus* in dilutions up to 1 to 3, but was not effective in greater dilutions. It is recommended that in practice a 1 to 1½ per cent solution of chemically pure acetic acid or commercial cider vinegar diluted with an equal quantity of water be used. Infected soil saturated with undiluted commercial cider vinegar failed to produce disease in six rabbits which were inoculated with it. The results of these experiments warrant a trial of cider vinegar or acetic acid in the various necrotic conditions in animals due to the *Bacillus necrophorus*, such as necrotic stomatitis of calves, the necrotic conditions affecting swine, foot rot, lip and leg ulceration of sheep, necrosis of the vulva and anus of cattle, etc. A calf which presented swellings in each cheek about the size of a walnut, with necrosis of the mucous membrane covering the inner side of the swelling, was recently treated with very satisfactory results by washing out the mouth three times daily with a solution consisting of one part of cider vinegar and three parts of water. The *Bacillus necrophorus* had been previously demonstrated in a similar case in a calf in the same herd.—*From University of Pennsylvania Bulletin, Veterinary Extension Quarterly, No. 2, page 1, by Louis A. Klein,*

SERUM TREATMENT GUARANTY BINDING

IN Simons Brick Company v. Wiglesworth, 193 Pacific 947, decided November 20, 1920, the Supreme Court of California affirmed the judgment of the trial court against Ed Wiglesworth, president of the Interstate Vaccine Company.

Wiglesworth during the spring of 1916 called on the president of the brick company and endeavored to induce him to have its hogs vaccinated by the Interstate Company. As an inducement he stated he would personally guarantee the immunity of the hogs from cholera for the balance of their natural lives.

The following fall without further dealings with Wiglesworth plaintiff employed the Vaccine Company and their hogs were vaccinated.

A number of them thereafter died of cholera and the brick company sued to recover their net value, $5,637.20. The trial court awarded judgment for that amount.

On appeal the defendant set up as a defense the argument that the guaranty was not in writing, hence not binding; but the Supreme Court held that the promise could be and was considered a primary guaranty and of a nature not required to be in writing.

While the offer of guaranty was one which would ordinarily require acceptance within such time as the parties contemplated, the evidence supported the view of the trial court that plaintiff understood the guaranty to hold good until the hogs were vaccinated.—*National Live Stock Exchange Bulletin.*

MOTOR TRUCKS AND HORSES ON FARMS

The motor truck is supplementing rather than supplanting the horse on the farm. That is the conclusion reached from a study by the United States Department of Agriculture on the use of motor trucks on 831 farms in the Corn Belt. It was found that only 43 per cent of the farmers had reduced the number of their work horses since purchasing trucks. Twenty-five per cent disposed of one or two horses, and 18 per cent of more than two horses. The average reduction for all farms was 1.2 head.

In the opinions of the farmers consulted, the principal advantage of a motor truck is in saving time, and the principal disadvantage is poor roads. As compared with horses and wagons,

the trucks save about two-thirds of the time required for hauling to and from the farms. A majority of the farmers still use their horses for some hauling on the road. On more than half of the farms all the hauling in the fields and around the buildings is still done with horses and wagons.

SEMON'S LAW

In all progressive lesions of the centers and trunks of the motor laryngeal nerves, the abductors of the vocal cords succumb much earlier than the adductors.

In conjunction with Sir Victor Horsley, Professor Doctor Semon elucidated the central motor innervation of the larynx, and showed that it was practically impossible for a one-sided cortical lesion to produce laryngeal paralysis. A generalization of great practical importance, known as Semon's Law, which followed from his researches is that "abductor paralysis (which may be associated with adductor) is due to organic disease, while adductor paralysis is in a great majority of cases functional, more rarely myopathic, and then usually due to catarrh."

Semon was a great laryngologist and his idea or law may be of some interest to veterinarians in working and the causes or pathology of laryngeal paresis in solipeds.

C. A. CARY.

COMMISSIONER HALLADAY

Mr. H. H. Halladay, who for a number of years was in charge of the animal industry work of Michigan, has been appointed by Governor Grossbeck to the recently created office of Commissioner of Agriculture, with a broader field of endeavor and enlarged responsibilities. On learning of his action, Secretary H. Preston Hoskins was directed by the members of the Southeastern Michigan Veterinary Association to send the Governor a hearty expression of their unanimous indorsement of this wise and timely appointment. Dr. Hoskins' letter in part is as follows:

"Every member of our association is personally acquainted with Mr. Halladay, and we have come to admire him, both as a man and as a public official.

"Mr. Halladay has the reputation of being fair in all his dealings, always desirous of doing what he considers the best for the greatest number. He has on many occasions demonstrated that he is always forward-looking, and in matters agricultural,

especially as they pertain to animal industry, he has on numerous occasions shown himself eminently equipped to discharge the duties of this higher office, to which you have seen fit to appoint him and which we consider so richly deserved."

FOOT-AND-MOUTH DISEASE IN IRELAND

An outbreak of foot-and-mouth disease among cattle near Nottingham, England, has been traced to Ireland. These cattle were imported from Ireland and were evidently infected with the disease at the time of their importation. Pending full inquiries as to the origin and extent of the disease in Ireland, which has not had any of the infection for several years, all local authorities in Great Britain have been instructed to make an immediate veterinary examination of all living animals landed from Ireland since March 19 and for their detention for at least 21 days from the date of landing. Furthermore, the landing of animals from any port in Ireland has been prohibited at any port in Great Britain until further notice.

HEALTH REQUIREMENTS AT THE DAIRY CATTLE CONGRESS

The 1921 Dairy Cattle Congress, which will be held in its permanent home at Waterloo, Iowa, September 26 to October 2, has adopted stringent regulations in regard to the health requirements of the cattle exhibits.

All cattle brought onto the show grounds for exhibition or other purposes shall either be from a tuberculosis-free accredited herd or they shall have passed a satisfactory tuberculin test and found to be free from tuberculosis, not more than ninety days prior to the opening date, September 26. Only tests made by veterinarians approved by both the Federal Bureau of Animal Industry and the State veterinary departments will be accepted.

Before the cattle are placed in the barns, each exhibitor will be required to present to the cattle superintendent a health certificate and tuberculin temperature chart showing the results of the last test.

As a further precaution, all exhibition cattle coming from federally accredited herds will be assigned to a certain portion of the barn. The construction and arrangement of the cattle pavilion is such that this can easily be done and still have all

the cattle of one breed in the same division, thus in no way detracting from the appearance of the show.

The barns will all be thoroughly disinfected previous to the opening of the show, which practice has been followed for the past five years.—*Wallaces' Farmer.*

In the New York *Medical Journal* of April 6, 1921, is an interesting and timely article by Dr. C. J. Marshall, entitled "Measures for the Control of Tuberculosis in Cattle," which was read before the Philadelphia County Medical Society. The JOURNAL is alway pleased to see leading articles by veterinarians in contemporary medical journals and especially if such papers have been presented before medical societies. There is also a large field for such addresses at our leading livestock association meetings.

Dr. B. L. Lake, who has been located at Teutopolis, Illinois, has gone to Oregon, Illinois, where he has been appointed Veterinary Director of the Sinnissippi Farms, of Oregon, Illinois, and the Woodlawn Farms, of Sterling, Illinois.

Doctor Lake is a successful practitioner and his selection as veterinary director of these large farms shows that his ability is appreciated.

Dr. E. E. Wegner of the Veterinary Department, Washington State College, was recently promoted by his lodge of Elks from Leading Knight to Exalted Ruler.

Dr. W. Albertson Haines, although enjoying a large practice at Bristol, Pa., finds recreation in performing most excellent work as a member of his State Legislature, where he serves on four of the leading committees, including those on agriculture and public health.

Dr. Robert Y. Oosten has changed his location from Medaryville, Ind., to Demotte, Ind., and reports much satisfaction with his new surroundings in practice.

Dr. Otto Faust of Poughkeepsie, N. Y., was the principal speaker at the May meeting of the Hudson Valley Veterinary Medical Society at Sharon, Conn.

Dr. T. M. Dick, who was formerly located at Lake Village, Arkansas, has moved to Stuttgart, Arkansas.

Dr. E. T. Baker of Moscow, Idaho, is the official editor of *The Two Forty Niner*, a publication issued in the interests of B. P. O. E. No. 249 and approved by the Grand Lodge.

Dr. W. D. Way has removed from Richland Springs, N. Y., and will in the future practice at Westport, Essex County, New York.

That no cattle should be exhibited at the National Dairy Show beginning with the year 1924 unless they come from accredited herds, is expressed in a resolution of the American Jersey Cattle Club. The club also contemplates offering no premiums to fairs, cattle expositions, etc., unless the management of these institutions require all cattle exhibited to come from accredited herds.

The Oklahoma State Board of Veterinary Medical Examiners will hold the annual examination on June 27, 28, and 29, 1921, at the State Capitol. D. W. Gerber, president of the board, Oklahoma City.

Dr. W. H. Dalrymple, who has been confined to his bed for the past four weeks, has now recovered sufficiently to return to his duties as Dean and Director of the Louisiana College of Agriculture and Agricultural Experiment Station.

It is reported that the Brazilian Government will aid the importers of livestock in importing blooded animals by refunding the charges for freight from the country of origin to Brazil and by their free transportation into the interior.

Mr. John DeVine, son of Dr. J. F. DeVine of Goshen, N. Y., has been seriously ill with acute purulent appendicitis. For several days following the operation his condition was critical. Dr. DeVine's many friends will be glad to learn that his son is now convalescing nicely.

An International Veterinary Conference on Animal Diseases commenced its sessions at Paris on May 25. Dr. George Hilton, chairman of the Executive Board of the A. V. M. A., was to have attended this conference and to have furnished our Association with a report of his experiences, but at the last moment he found it impossible to go.

Dr. L. W. Goss, professor of pathology, Ohio State University, spent several days in Washington, D. C., recently as a representative of the A. V. M. A. in The National Research Council.

Dr. E. M. Nighbert, formerly in charge of Federal tick eradication work in Florida, has been transferred to London, England, as an assistant to Dr. W. H. Wray, who has been representing the government in Great Britain since 1890.

Dr. J. William Fink of Newburgh, N. Y., has returned to his practice, after spending several months in Texas and Arkansas seeking relief from an acute attack of neuritis.

Drs. S. H. Gilliland and E. K. Tingley of the Gilliland Laboratories, Ambler, Pa., were recent visitors to the Capital City.

According to a recent number of *La Terre Vaudoise* foot-and-mouth disease is still spreading in Switzerland with a "dreadful rapidity" in spite of regulations and restrictions.

Dr. W. Horace Hoskins was confined to his home during the early part of April with a recurrent attack of cardiac trouble.

A reliable authority computes the cost of foot-and-mouth disease to Spain last year at no less than twenty-five million dollars and to Holland for the years 1919-20 at a similar figure; while in regard to Great Britain, going back for something like twelve years, the amount paid in compensation for animals destroyed does not exceed an average of $5,000 a month.—(From *The Veterinary Record*, April 16, 1921.)